HEATHKIT® MANUAL

HEATH COMPANY • BENTON HARBOR, MICHIGAN

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YOUR HEATHKIT 90-DAY FULL WARRANTY

If you are not satisfied with our service - warranty or otherwise - or with our products, write directly to our Director of Customer Services, Heath Company, Benton Harbor, Michigan 49022. He will make certain your problems receive immediate, personal attention.

Our attorney, who happens to be quite a kitbuilder himself, insists that we describe our warranty using all the necessary legal phrases in order to comply with the new warranty regulations. Fine. Here they are:

For a period of ninety (90) days after purchase, Heath Company will replace or repair free of charge any parts that are defective either in materials or workmanship. You can obtain parts directly from Heath Company by writing us at the address below or by telephoning us at (616) 982-3571. And we'll pay shipping charges to get those parts to you — anywhere in the world.

We warrant that during the first ninety (90) days after purchase, our products, when correctly assembled, calibrated, adjusted and used in accordance with our printed instructions, will meet published specifications.

If a defective part or error in design has caused your Heathkit product to malfunction during the warranty period through no fault of yours, we will service it free upon proof of purchase and delivery at your expense to the Heath factory, any Heathkit Electronic Center (units of Schlumberger Products Corporation), or any of our authorized overseas distributors.

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Our warranty does not cover and we are not responsible for damage caused by the use of corrosive solder, defective tools, incorrect assembly, misuse, fire, or by unauthorized modifications to or uses of our products for purposes other than as advertised. Our warranty does not include reimbursement for customer assembly or set-up time.

This warranty covers only Heathkit products and is not extended to allied equipment or components used in conjunction with our products. **We are not responsible for incidental or consequential damages.** Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

HEATH COMPANY
BENTON HARBOR, MI. 49022

Prices and specifications subject to change without notice.

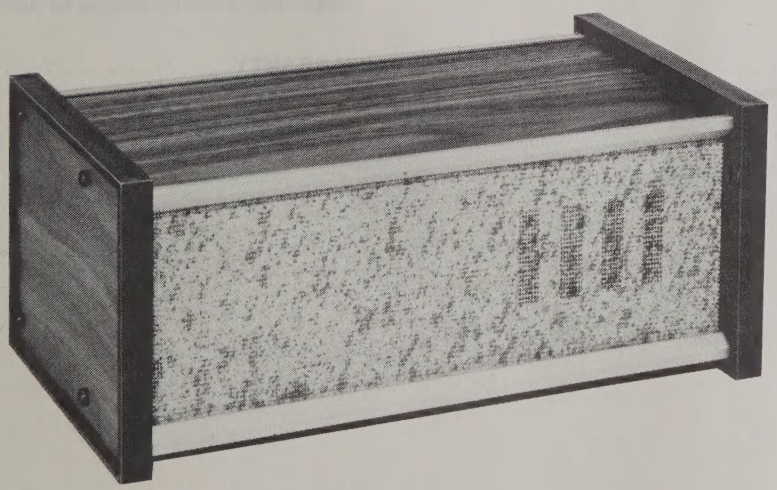
Heathkit® Manual

for the

CENTRAL PROCESSOR

Model GDA-1158-1

595-1711-06



HEATH COMPANY
BENTON HARBOR, MICHIGAN 49022

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INTRODUCTION

The Heathkit Model GDA-1158-1 Central Processor is the heart of the PLL Security Alarm System. It receives the signals that come to it through the power line from the sensor transmitters, and responds to these signals by triggering some external action to protect your property. This could mean that it would turn certain lights on or off, that it would set off an audible warning, or that it would turn on sprinklers, etc.

The internal circuitry of the Central Processor is contained on five circuit boards. A preconstructed test circuit board is included so the system can be aligned without instruments.

The five circuit boards (not the test circuit board) are housed inside of a rugged but attractive extruded metal cabinet.

Refer to the "Kit Builders Guide" for complete information on unpacking, parts identification, tools, wiring, soldering, and step-by-step assembly procedures.

UNPACKING INSTRUCTIONS

Refer to Figure 1 and remove the Central Processor from its carton. Note that one end of the central processor cabinet is marked with a label. Remove the four screws from the other end of the cabinet and remove the end panel. NOTE: The end panel with the label is permanently attached.

Carefully remove the parts from inside the cabinet and lay them in a safe place. DO NOT open any of the packages until you are instructed to do so. Also remove the rear panel from the cabinet.

Set the cabinet, end panel, and four screws aside. They will be reinstalled later. You may wish to temporarily reinstall the end panel for the time being.

Note that four of the parts bags have numbers on them. One of the numbered bags will be used with each of the circuit board Parts Lists. The "Final Pack" is made up of any loose parts and the "Misc" bag. In each Parts List you will be instructed to remove some parts from the Final Pack.

As you go through the following Parts Lists, locate only those parts that are needed for each segment of assembly. Do not throw away any parts that you may have left over until the unit is completely assembled and operating.

NOTE: If you have purchased Transmitters (On-Off Transmitter, Emergency Transmitter, Ultrasonic Detector, etc.) with your Central Processor, assemble the Transmitters first. The alignment instructions for the Transmitters are in this Manual only, and must be performed only after your Transmitter and the Central Processor are assembled.

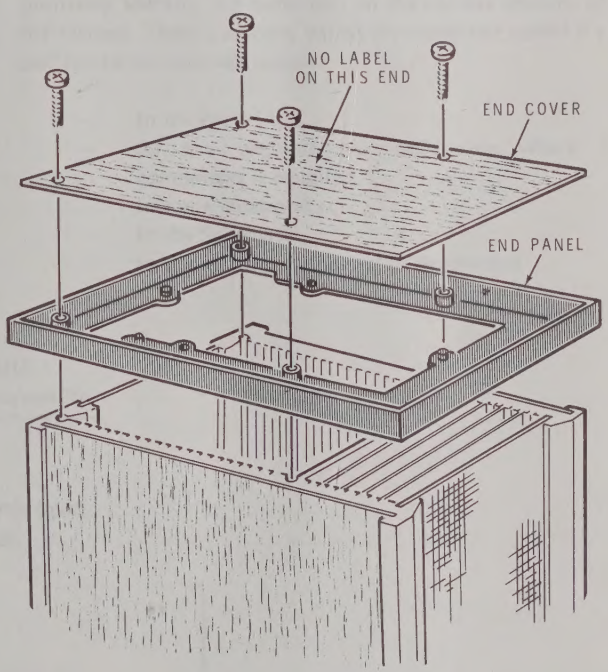


Figure 1

Before you start to assemble this kit, read the "Kit Builders Guide" for information on wiring, soldering, and step-by-step assembly procedures.

RF AND DEMODULATOR CIRCUIT BOARD

PARTS LIST

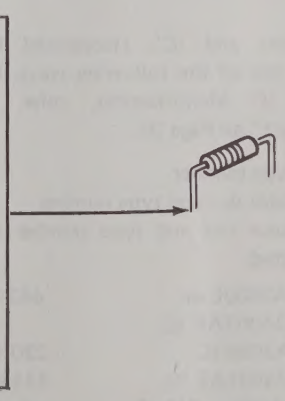
Locate the parts pack marked 1161. Check the parts in the pack against the following list. Make a check (✓) in the space provided as you identify each part. Do not throw away any packing material until all parts are accounted for.

To order a replacement part, use the Parts Order Form furnished with this kit. If a Parts Order Form is not available, refer to "Replacement Parts" inside the rear cover of the Manual. For pricing information, refer to the separate "Heath Parts Price List."

Each circuit part in this kit has its own component number (R2, C4, etc.). Use these numbers when you want to positively identify the same part in the various sections of the Manual. These numbers, which are especially useful if a part has be be replaced, appear:

- In the Parts Lists,
- At the beginning of each step where a component is installed,
- In some illustrations,
- In the Schematic,
- In the sections at the rear of the Manual.

QTY.	DESCRIPTION	PART No.	CIRCUIT Component No.
RESISTORS			
NOTE: The following resistors are all 1/4-watt*. A gold fourth band indicates 5% tolerance; a silver fourth band indicates 10% tolerance.			
( ) 1	47 Ω (yellow-violet-black)	1-58-12	R101
( ) 1	100 Ω (brown-black-brown)	1-60-12	R131
( ) 2	470 Ω (yellow-violet-brown)	1-65-12	R107, R113
( ) 2	2200 Ω (red-red-red)	1-72-12	R102,R109
( ) 3	10 kΩ (brown-black-orange)	1-80-12	R110A,R111, R133
( ) 5	22 kΩ (red-red-orange)	1-91-12	R106,R108,R110B, R114,R132
( ) 4	47 kΩ (yellow-violet-orange)	1-83-12	R116,R117B, R122,R123



*Resistors ordered as replacement parts may be a larger physical size than the resistors supplied with this kit.

QTY.	DESCRIPTION	PART No.	CIRCUIT Component No.
Resistor (cont'd.)			
( ) 9	100 kΩ (brown-black-yellow)	1-84-12	R117A, R119, R124, R125, R126, R127, R128, R129, R130
( ) 2	220 kΩ (red-red-yellow)	1-38-12	R115, R121
( ) 4	470 kΩ (yellow-violet-yellow)	1-86-12	R104, R118, R120, R134
( ) 1	4.7 MΩ (yellow-violet-green)	1-109-12	R103
CAPACITORS			
( ) 2	10 μF electrolytic	25-257	C111, C112
( ) 1	47 μF electrolytic	25-98	C113

NOTE: The following block capacitors may be packed inside a piece of protective packing as shown at the right.

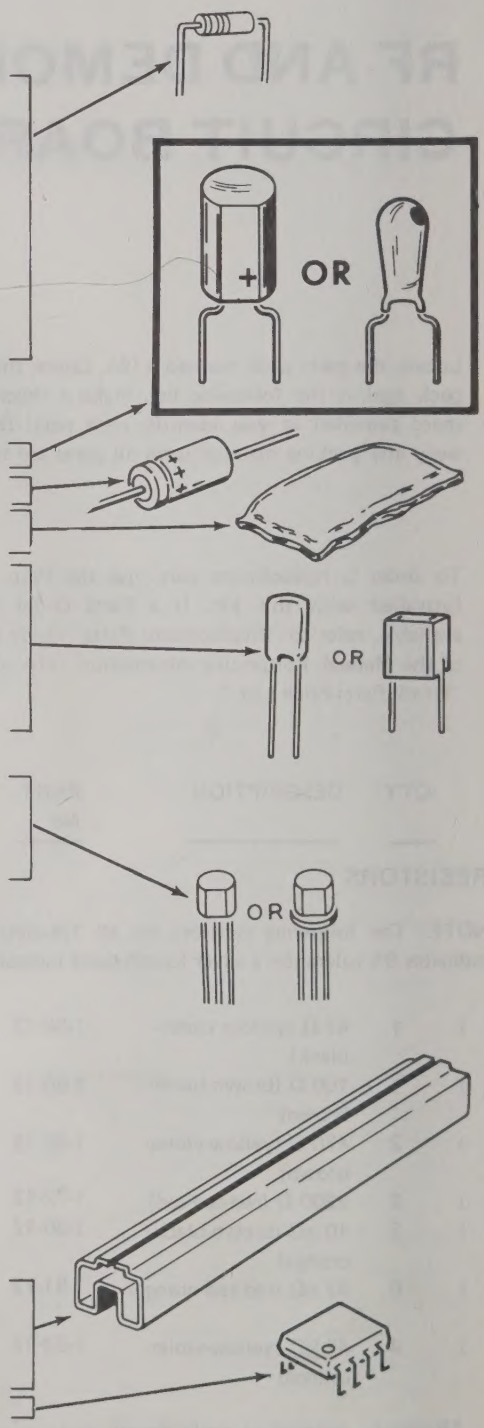
( ) 2	.010 μF (10n) block	230-624	C101, C105
( ) 3	.0022 μF (2.2n) block	230-1537	C102, C103, C106
( ) 1	.1 μF block	230-623	C108
( ) 3	.47 μF block	230-1507	C107, C109, C110
TRANSISTORS-IC's (Integrated Circuits)			
( ) 2	B-1098 or GE1691 (white dot) transistor	417-201	Q101, Q103
( ) 2	B-1097 or GE-4936 (no dot) transistor	417-118	Q102, Q104

NOTE: DO NOT remove IC's from their protective holder until you are instructed to do so. Some of these IC's are susceptible to damage through handling.

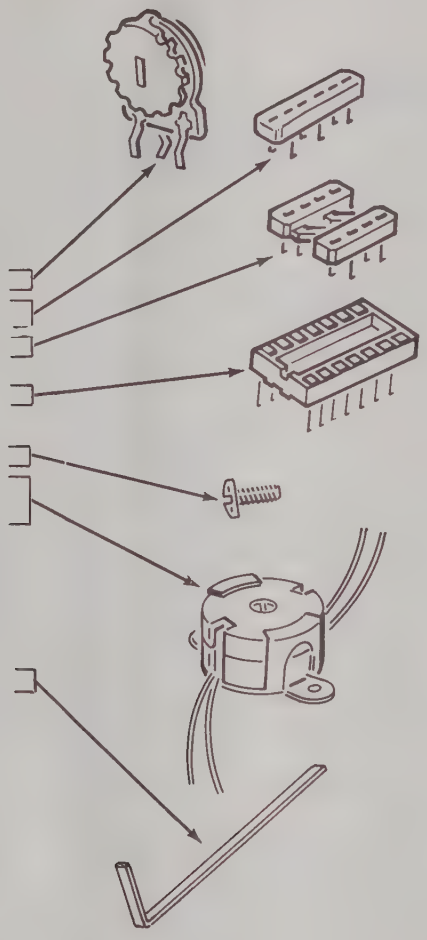
NOTE: Transistors and IC's (Integrated Circuits) are marked for identification in one of the following ways. For further information on transistor and IC identification, refer to the "Semiconductor Identification Chart" on Page 90.

1. Type number.
2. Color dot and type number.
3. Color dot and type number other than the one listed.

( ) 2	CA3600E or CD4007AE IC	443-604	A101, A103
( ) 2	CA3086 IC	230-1539	A104, A106
( ) 1	CD4001AE IC	443-695	A102
( ) 1	A-1060 or 741 IC	442-22	A105



QTY.	DESCRIPTION	PART No.	CIRCUIT Component No.



GENERAL

( )	1	5 kΩ control	10-904	R112
( )	1	6-pin connector	230-1522	
( )	1	8-pin IC socket	434-266	
( )	5	14-pin IC socket	434-225	
( )	20"	Bare wire (#20)	340-2	
( )	2	4-40 x 1/4" screw	250-52	
( )	1	56 kHz transformer (gold dot)	230-1516	T101

PARTS FROM FINAL PACK

( )	1	RF and demodulator circuit board (1161)	230-1515
( )	1	Phillips screwdriver	490-2
( )	1	IC puller	490-111
( )	1	Kit Builders Guide	597-308
( )	1	Parts Order Form	597-260
( )	1	Instruction sheet	597-1495
		Assembly Manual (See Page 1 for part number.)	
		Solder	

STEP-BY-STEP ASSEMBLY

START

Place the RF and demodulator circuit board (#1161) on your work area as shown in the Pictorial. Then complete the following steps.

( ) R130: 100 kΩ (brown-black-yellow).

( ) R129: 100 kΩ (brown-black-yellow).

( ) R128: 100 kΩ (brown-black-yellow).

( ) R124: 100 kΩ (brown-black-yellow).

( ) R121: 220 kΩ (red-red-yellow).

( ) R101: 47 Ω (yellow-violet-black).

( ) R122: 47 kΩ (yellow-violet-orange).

( ) R126: 100 kΩ (brown-black-yellow).

SAFETY WARNING: Avoid eye injury when you clip off excess leads. We suggest that you wear glasses and hold the lead ends so they do not fly up when you cut them off.

( ) Solder the leads to the foil and cut off the excess lead lengths.

( ) R123: 47 kΩ (yellow-violet-orange).

( ) R115: 220 kΩ (red-red-yellow).

( ) R120: 470 kΩ (yellow-violet-yellow).

( ) R116: 47 kΩ (yellow-violet-orange).

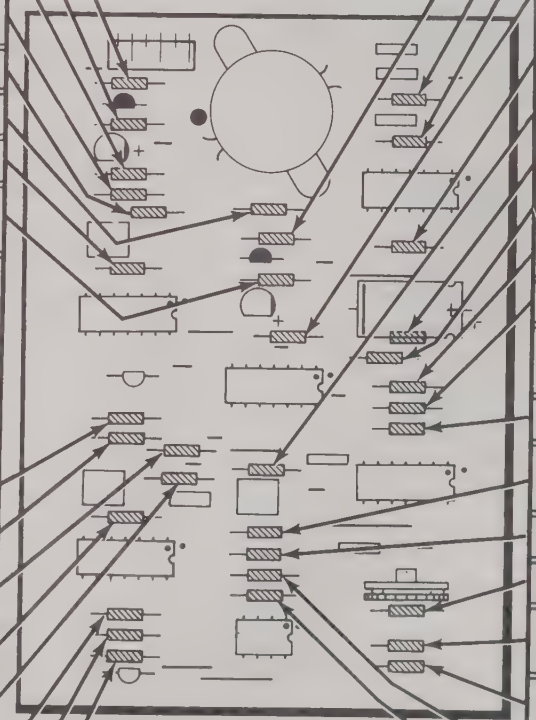
( ) R118: 470 kΩ (yellow-violet-yellow).

( ) R119: 100 kΩ (brown-black-yellow).

( ) R117A: 100 kΩ (brown-black-yellow).

( ) R117B: 47 kΩ (yellow-violet-orange).

( ) Solder the leads to the foil and cut off the excess lead lengths.



PICTORIAL 1-1

CONTINUE

( ) R127: 100 kΩ (brown-black-yellow).

( ) R102: 2200 Ω (red-red-red).

( ) R103: 4.7 MΩ (yellow-violet-green).

( ) R125: 100 kΩ (brown-black-yellow).

( ) R104: 470 kΩ (yellow-violet-yellow).

( ) R108: 22 kΩ (red-red-orange).

( ) R131: 100 Ω (brown-black-brown).

( ) R106: 22 kΩ (red-red-orange).

( ) R109: 2200 Ω (red-red-red).

( ) R107: 470 Ω (yellow-violet-brown).

( ) Solder the leads to the foil and cut off the excess lead lengths.

( ) R111: 10 kΩ (brown-black-orange).

( ) R134: 470 kΩ (yellow-violet-yellow).

( ) R132: 22 kΩ (red-red-orange).

( ) R133: 10 kΩ (brown-black-orange).

( ) R110A: 10 kΩ (brown-black-orange).

( ) R110B: 22 kΩ (red-red-orange).

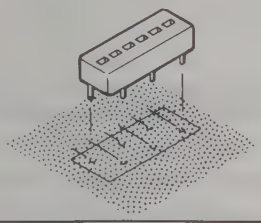
( ) R113: 470 Ω (yellow-violet-brown).

( ) R114: 22 kΩ (red-red-orange).

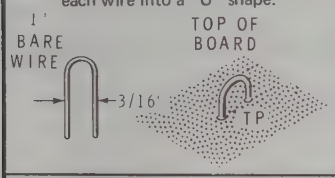
( ) Solder the leads to the foil and cut off the excess lead lengths.

START

( ) Connector #4. Mount a 6-pin connector as shown. Push the pins into the circuit board; then solder its six leads to the foil.



( ) Cut eleven 1" bare wires. Then bend each wire into a "U" shape.



NOTE: In the following steps, insert the U-shaped wires into the circuit board only far enough so they can be soldered to the foil. Then solder the wires to the foil.

( ) TP9: Test point loop.

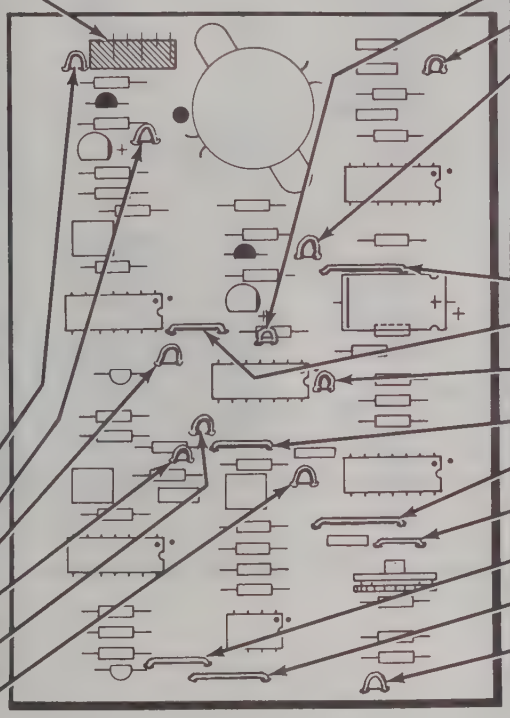
( ) TP10: Test point loop.

( ) TP11: Test point loop.

( ) TP5: Test point loop.

( ) TP7: Test point loop.

( ) TP8: Test point loop.



CONTINUE

( ) TP3: Test point loop.

( ) TP2: Test point loop.

( ) TP1: Test point loop.

NOTE: When you install wires, as in the following step, cut a bare wire to the indicated length. Bend the wire 1/4" from each end. Then mount the wire onto the board, solder its leads to the foil, and cut off any excess wire lengths.

( ) 1" wire.

( ) 3/4" wire.

( ) TP4: Test point loop.

( ) 7/8" wire.

( ) 1-1/8" wire.

( ) 3/4" wire.

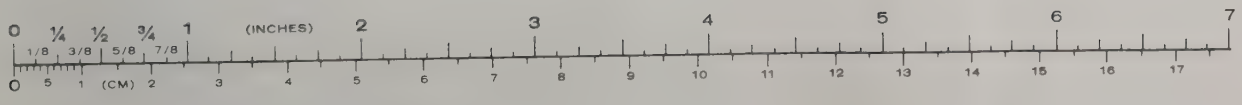
( ) 7/8" wire.

( ) 1" wire.

( ) TP6: Test point loop.

( ) Be sure each wire is soldered to the foil, and that all excess lead lengths have been cut off.

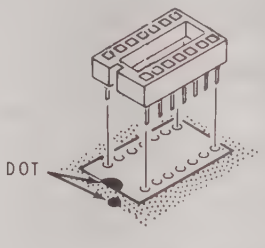
PICTORIAL 1-2



START

NOTE: In the following steps, install IC sockets as follows:

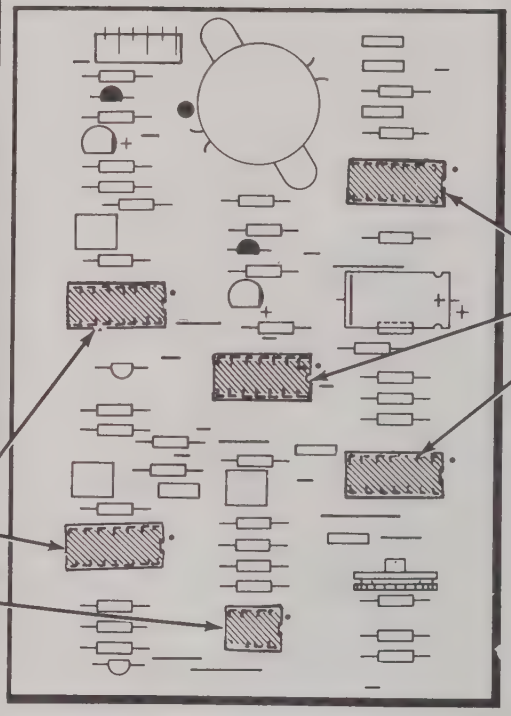
Install the socket in the circuit board as shown. Then solder the socket pins to the foil.



( ) 14-pin IC socket.

( ) 14-pin IC socket.

( ) 8-pin IC socket.



CONTINUE

( ) 14-pin IC socket.

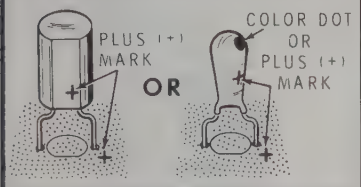
( ) 14-pin IC socket.

( ) 14-pin IC socket.

PICTORIAL 1-3

START

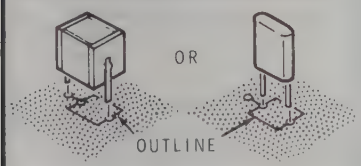
NOTE: When you install electrolytic capacitors, be sure to match the plus (+) mark or color dot on the capacitor with the positive (+) mark on the board.



( ) C112: 10 µF electrolytic.

( ) C111: 10 µF electrolytic.

NOTE: Some of the following block capacitors can be one of two types. Always mount the capacitor over the outline on the circuit board and use the holes that fit the capacitor lead spacing.

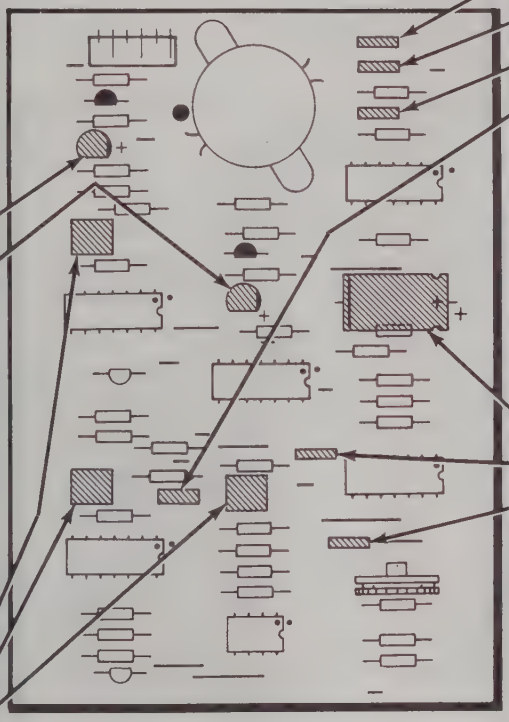


( ) C110: .47 µF block.

( ) C109: .47 µF block.

( ) C107: .47 µF block.

( ) Solder the leads to the foil and cut off the excess lead lengths.



CONTINUE

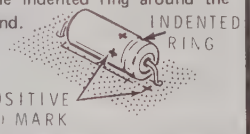
( ) C101: .01 µF (10n) block.

( ) C102: .0022 µF (2.2n) block.

( ) C103: .0022 µf (2.2n) block.

( ) C108: .1 µF block.

NOTE: When you install the following electrolytic capacitor, match the positive (+) mark on the capacitor to the positive (+) mark on the circuit board as shown. Also note the indented ring around the positive (+) end.



( ) C113: 47 µF electrolytic.

( ) C105: .01 µF (10n) block.

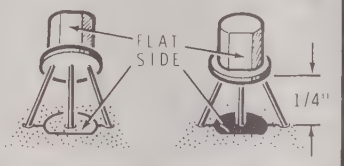
( ) C106: .0022 µf (2.2n) block.

( ) Solder the leads to the foil and cut off the excess lead lengths.

PICTORIAL 1-4

START

NOTE: As you install transistors in the following steps, be sure to match the flat of the transistor with the flat outline on the circuit board. Solder the leads to the foil and cut off the excess lead lengths.

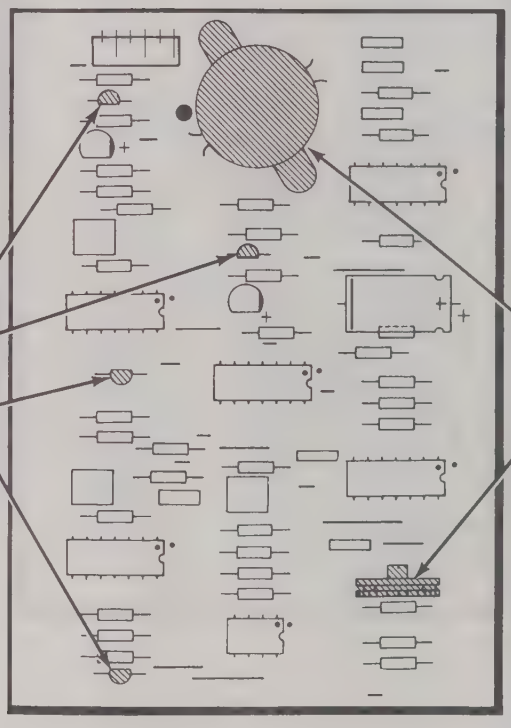


( ) Q102: B-1097 or GE4936 (no dot) transistor (#417-118).

( ) Q104: B-1097 or GE4936 (no dot) transistor (#417-118).

( ) Q101: B-1098 or GE1691 (white dot) transistor (#417-201).

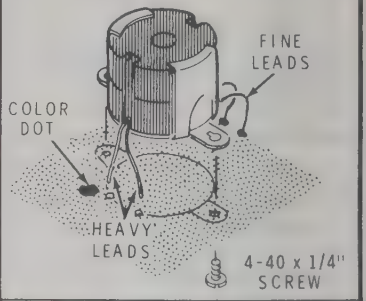
( ) Q103: B-1098 or GE1691 (white dot) transistor (#417-201).



PICTORIAL 1-5

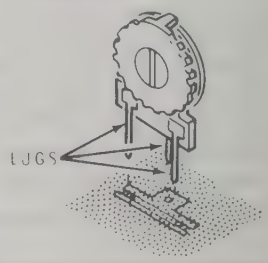
CONTINUE

IMPORTANT: Look carefully at the 56 kHz transformer (#230-1516) and notice that it has two fine leads and two heavy leads. When you install the transformer in the following step, make sure you insert the **heavy** leads into the holes nearest the color dot on the circuit board. Disregard the color dot on the transformer.



( ) T101: Insert the transformer leads through the circuit board holes. Mount the transformer with two 4-40 × 1/4" screws. Then solder the leads to the foil and cut off the excess lead lengths.

( ) R112: 5000 Ω (5K) control. Solder the lugs to the foil.



CIRCUIT BOARD CHECKOUT

Carefully inspect the circuit board for the following conditions. NOTE: The IC's will be installed after Circuit Board Checkout.

( ) Unsoldered connections.

( ) "Cold" solder connections.

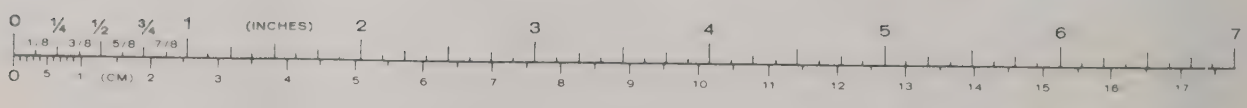
( ) Solder bridges between foil patterns.

( ) Protruding leads which could touch together.

( ) Transistors and IC's for the proper type and installation.

( ) Electrolytic capacitors for the correct position of the positive (+) end.

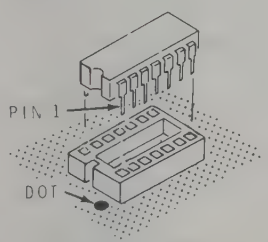
FINISH



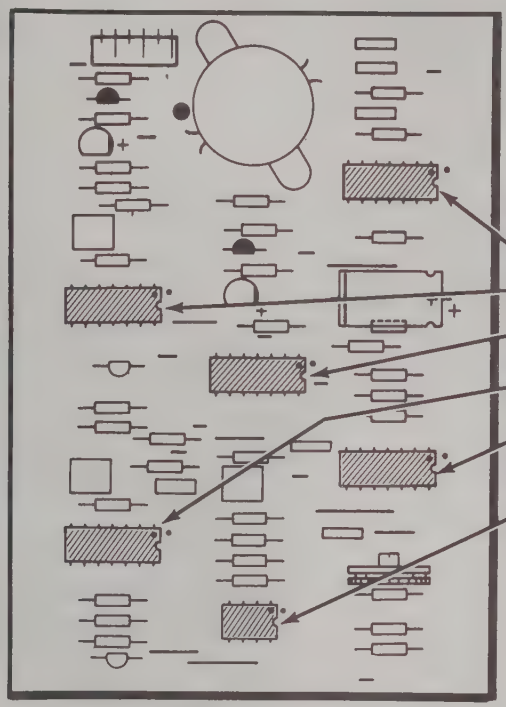
START

CAUTION: Some of the following IC's are extremely delicate and can be damaged by static electricity if they are not handled properly. Refer to the following five steps and install the IC exactly as instructed.

1. Pick up the IC holder in one hand and remove the IC with the other hand. Once the IC has been removed from the holder, do not lay the IC down or let its pins touch any object.
2. Check the IC pins to make sure they are straight. NOTE: It is alright to use a pair of pliers to straighten an IC pin as long as you hold the pliers in one hand and the IC in the other hand.
3. Refer to Detail 1-6A and identify pin 1.
4. Pick up the circuit board in your free hand and allow the foil to make contact with your hand.
5. Align pin 1 of the IC with the dot on the circuit board and start the IC pins into the socket. Make sure each pin is going into the socket, then gently push the IC down into the socket.



NOTE: If it should become necessary to remove an IC from its socket, use the IC puller (see Detail 1-6B).



PICTORIAL 1-6

CONTINUE

( ) A101: CA3600E or CD4007AE IC.

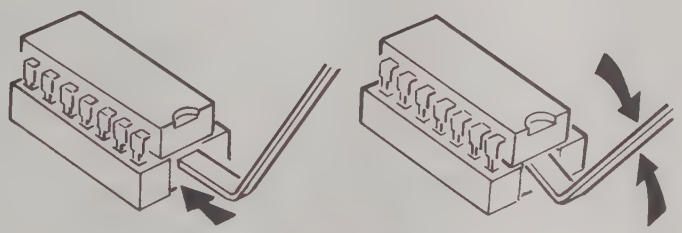
( ) A104: CA3086 IC.

( ) A102: CD4001AE IC.

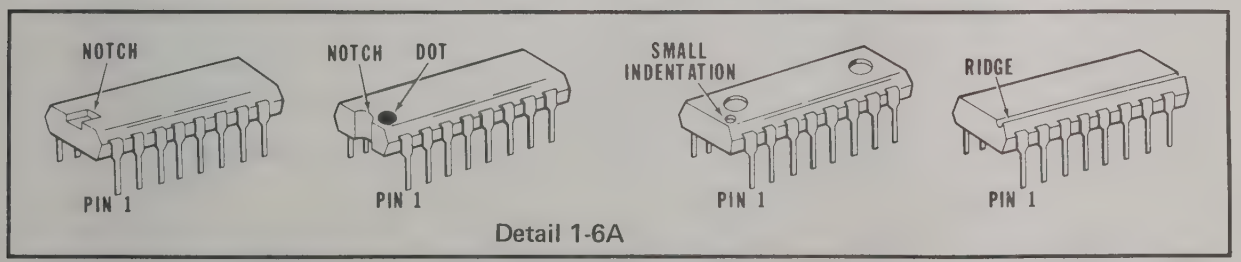
( ) A106: CA3086 IC.

( ) A103: CA3600E or CD4007AE IC.

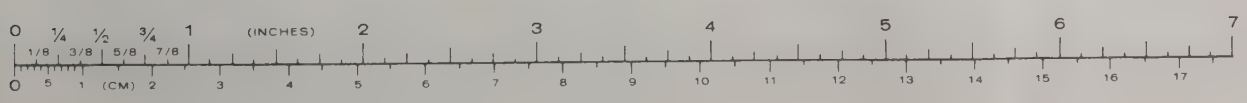
( ) A105: A-1060 or 741 IC. NOTE: This IC is not in the holder and does not require special handling.



Detail 1-6B



Detail 1-6A



EMERGENCY CIRCUIT BOARD

PARTS LIST

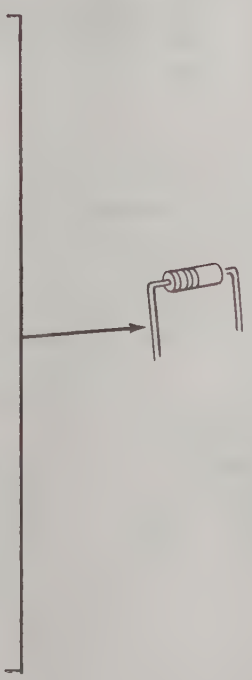
Locate the parts pack marked 1162. Check each part in the pack against the following list. Make a check (✓) in the space provided as you identify each part. Do not throw away any packing material until all parts are accounted for.

To order a replacement part, use the Parts Order Form furnished with this kit. If a Parts Order Form is not available, refer to "Replacement Parts" inside the rear cover of the Manual. For pricing information, refer to the separate "Heath Parts Price List."

RESISTORS

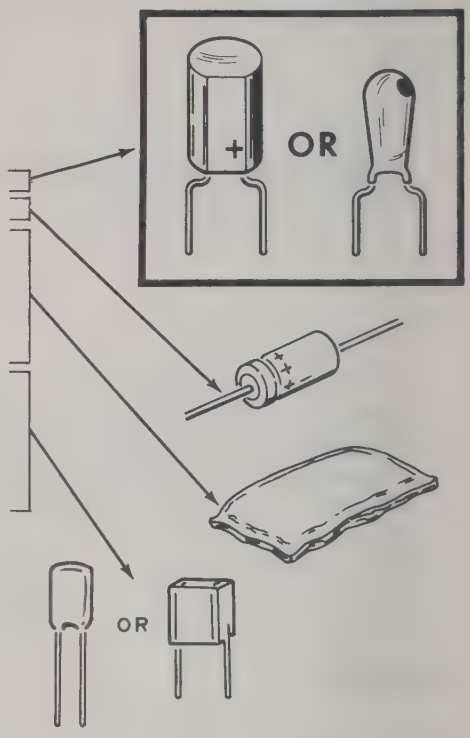
NOTE: The following resistors are all 1/4-watt*. A gold fourth band indicates 5% tolerance; a silver fourth band indicates 10% tolerance.

QTY.	DESCRIPTION	PART No.	CIRCUIT Component No.
( ) 1	47 Ω (yellow-violet-black)	1-58-12	R201
( ) 1	100 Ω (brown-black-brown)	1-60-12	R231
( ) 2	470 Ω (yellow-violet-brown)	1-65-12	R207, R213
( ) 2	2200 Ω (red-red-red)	1-72-12	R202, R209
( ) 1	4700 Ω (yellow-violet-red)	1-76-12	R206
( ) 2	10 kΩ (brown-black-orange)	1-80-12	R210A, R211
( ) 4	22 kΩ (red-red-orange)	1-91-12	R208,R210B, R214,R232
( ) 2	47 kΩ (yellow-violet-orange)	1-83-12	R222,R223
( ) 5	100 kΩ (brown-black-yellow)	1-84-12	R224,R228, R229, R230, R233
( ) 3	220 kΩ (red-red-yellow)	1-38-12	R215, R216, R221
( ) 3	470 kΩ (yellow-violet-yellow)	1-86-12	R204,R220, R234
( ) 1	4.7 MΩ (yellow-violet-green)	1-109-12	R203



*Resistors ordered as replacement parts may be a larger physical size than the resistors supplied with this kit.

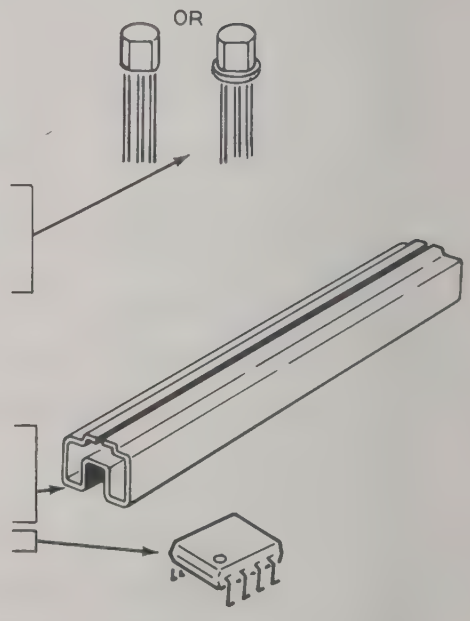
	QTY.	DESCRIPTION	PART No.	CIRCUIT Component No.
CAPACITORS				
( )	2	10 μF electrolytic	25-257	C212, C213
( )	1	47 μF electrolytic	25-98	C204
		NOTE: The following block capacitors may be packed inside a piece of protective packing as shown at the right.		
( )	1	.010 μF (10n) block	230-624	C201
( )	3	.0022 μF (2.2n) block	230-1537	C202, C203, C206
( )	2	.1 μF block	230-623	C205, C208
( )	2	.47 μF block	230-1507	C207, C210



TRANSISTORS-IC's (Integrated Circuits)

NOTE: Transistors and IC's (Integrated Circuits) are marked for identification in one of the following ways. For further information on transistor and IC identification, refer to the "Semiconductor Identification Chart" on Page 90.

1. Type number.
2. Color dot and type number.
3. Color dot and type number other than the one listed.

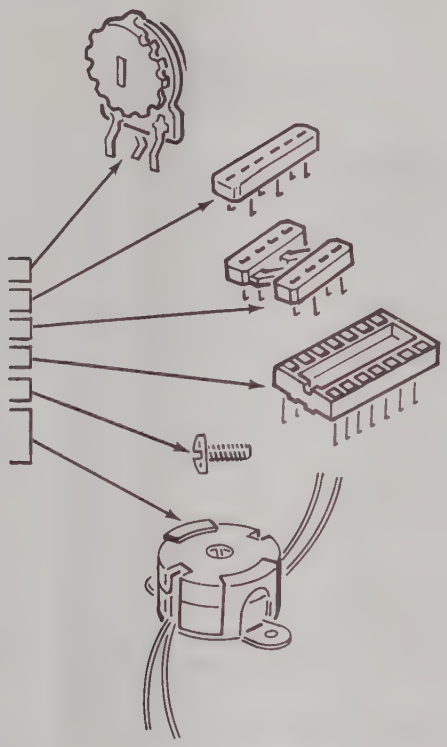


( )	1	B-1098 or GE-1691 (white dot) transistor	417-201	Q201
( )	2	B-1097 or GE4936 (no dot) transistor	417-118	Q202, Q203

NOTE: DO NOT remove the IC's from their protective holder until you are instructed to do so. Some of these IC's are susceptible to damage through handling.

( )	2	CA3600E or CD4007AE IC	443-604	A201, A203
( )	1	CA3086 IC	230-1539	A204
( )	1	CD4001AE IC	443-695	A202
( )	1	A-1060 or 741 IC	442-22	A205

QTY.	DESCRIPTION	PART No.	CIRCUIT Component No.



GENERAL

( )	1	5 kΩ control	10-904	R212
( )	1	6-pin connector	230-1522	
( )	1	8-pin IC socket	434-266	
( )	4	14-pin IC socket	434-225	
( )	2	4-40 x 1/4" screw	250-52	
( )	1	40 kHz transformer (black dot)	230-1513	T201
( )	20"	Bare wire (#20)	340-2	

PARTS FROM FINAL PACK

( )	1	Emergency circuit board - (1162)	230-1512

STEP-BY-STEP ASSEMBLY

START

Position the emergency circuit board (#1162) as shown in the Pictorial. Then proceed with the following steps.

( ) R201: 47 Ω (yellow-violet-black).

( ) R215: 220 kΩ (red-red-yellow).

( ) R216: 220 kΩ (red-red-yellow).

( ) R208: 22 kΩ (red-red-orange).

( ) R230: 100 kΩ (brown-black-yellow).

( ) R229: 100 kΩ (brown-black-yellow).

( ) Solder the leads to the foil and cut off the excess lead lengths.

( ) R228: 100 kΩ (brown-black-yellow).

( ) R224: 100 kΩ (brown-black-yellow).

( ) R220: 470 kΩ (yellow-violet-yellow).

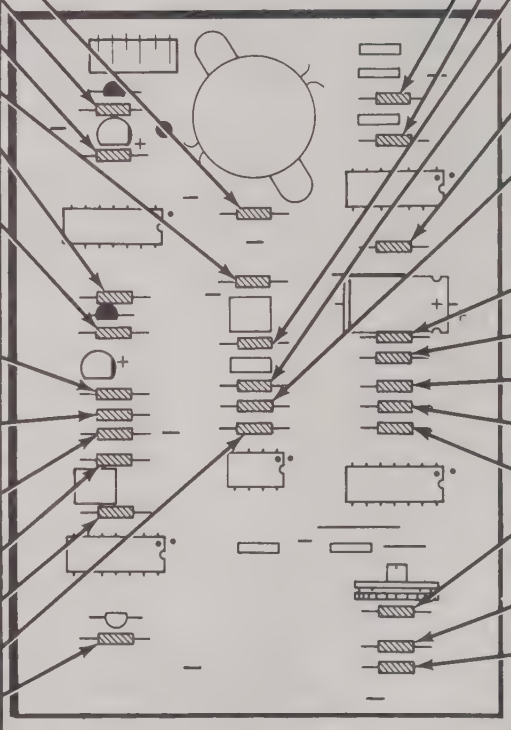
( ) R221: 220 kΩ (red-red-yellow).

( ) R222: 47 kΩ (yellow-violet-orange).

( ) R214: 22 kΩ (red-red-orange).

( ) R223: 47 kΩ (yellow-violet-orange).

( ) Solder the leads to the foil and cut off the excess lead lengths.



CONTINUE

( ) R202: 2200 Ω (red-red-red).

( ) R203: 4.7 MΩ (yellow-violet-green).

( ) R232: 22 kΩ (red-red-orange).

( ) R234: 470 kΩ (yellow-violet-yellow).

( ) R204: 470 kΩ (yellow-violet-yellow).

( ) R213: 470 Ω (yellow-violet-brown).

( ) Solder the leads to the foil and cut off the excess lead lengths.

( ) R231: 100 Ω (brown-black-brown).

( ) R207: 470 Ω (yellow-violet-brown).

( ) R209: 2200 Ω (red-red-red).

( ) R206: 4700 Ω (yellow-violet-red).

( ) R211: 10 kΩ (brown-black-orange).

( ) R233: 100 kΩ (brown-black-yellow).

( ) R210A: 10 kΩ (brown-black-orange).

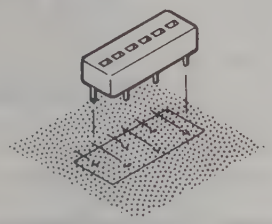
( ) R210B: 22 kΩ (red-red-orange).

( ) Solder the leads to the foil and cut off the excess lead lengths.

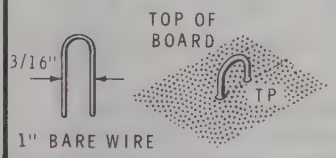
PICTORIAL 2-1

START

( ) Connector #1. Mount a 6-pin connector as shown. Push the pins into the circuit board; then solder its six leads to the foil.



( ) Cut nine 1" bare wires. Then bend each wire in a "U" shape.

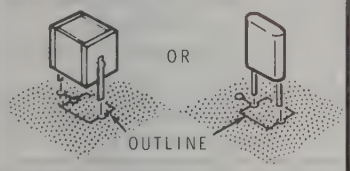


NOTE: In the following steps, insert the U-shaped wires into the circuit board only far enough so they can be soldered to the foil. Then solder the wires to the foil.

( ) TP9: Test point loop.

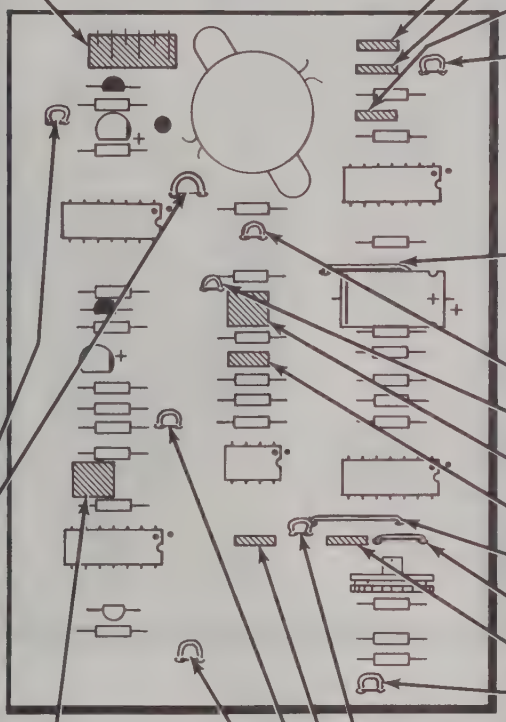
( ) TP3: Test point loop.

NOTE: Some of the following block capacitors can be one of two types. Always mount the capacitor over the outline on the circuit board and use the holes that fit the capacitor lead spacing.



( ) C210: .47 µF block.

( ) Solder the leads to the foil and cut off the excess lead lengths.



CONTINUE

( ) C201: .01 µF (10n) block.

( ) C202: .0022 µF (2.2n) block.

( ) C203: .0022 µf (2.2n) block.

( ) TP2: Test point loop.

NOTE: When you install wires, as in the following step, cut a bare wire to the indicated length. Bend the wire 1/4" from each end. Then mount the wire onto the board, solder its leads to the foil, and cut off any excess wire lengths.

( ) 1" wire.

( ) Solder the leads to the foil and cut off the excess lead lengths.

( ) TP1: Test point loop.

( ) TP5: Test point loop.

( ) C207: .47 µF block.

( ) C208: .1 µF block.

( ) 1-1/8" wire.

( ) 7/8" wire.

( ) C206: .0022 µf (2.2n) block.

( ) TP6: Test point loop.

( ) TP8: Test point loop.

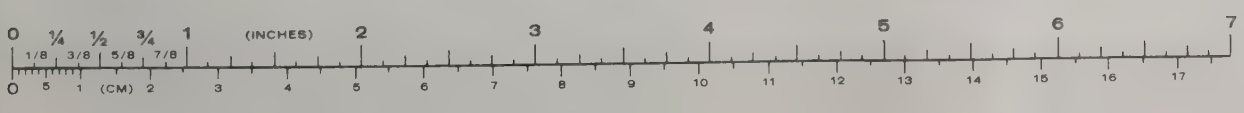
( ) C205: .1 µF block.

( ) TP7: Test point loop.

( ) TP11: Test point loop.

( ) Solder the leads to the foil and cut off the excess lead lengths.

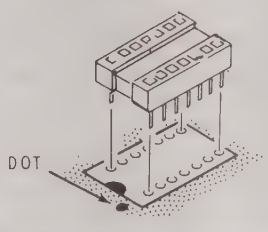
PICTORIAL 2-2



START

NOTE: In the following steps, install IC sockets as follows:

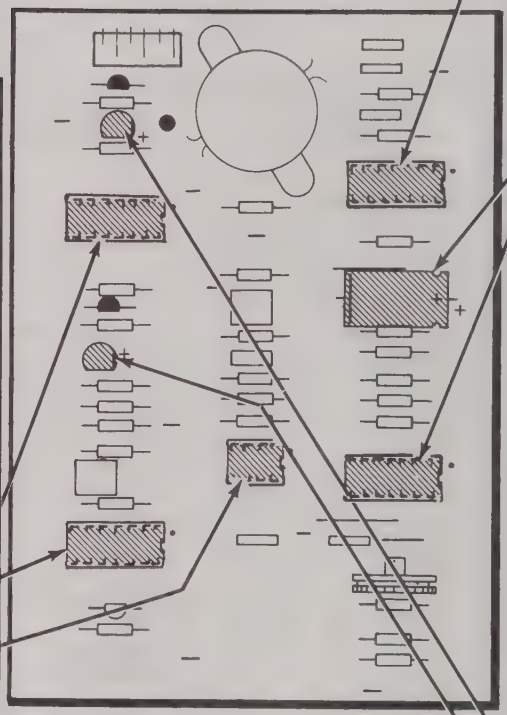
1. Install the socket in the circuit board.



( ) 14-pin IC socket.

( ) 14-pin IC socket.

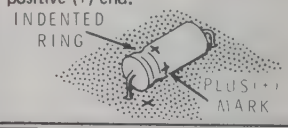
( ) 8-pin IC socket.



CONTINUE

( ) 14-pin IC socket.

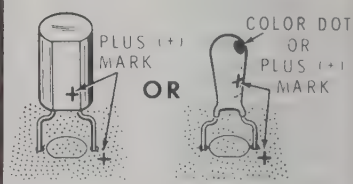
NOTE: When you install the following electrolytic capacitor, match the positive (+) mark on the capacitor to the positive (+) mark on the circuit board as shown. Also note the indented ring around the positive (+) end.



( ) C204: 47 µF electrolytic.

( ) 14-pin IC socket

NOTE: When you install electrolytic capacitors, be sure to match the plus (+) mark or color dot on the capacitor with the plus (+) mark on the circuit board as shown.



( ) C213: 10 µF electrolytic.

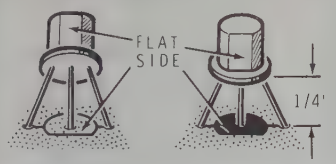
( ) C212: 10 µF electrolytic.

( ) Solder the leads to the foil and cut off the excess lead lengths.

PICTORIAL 2-3

START

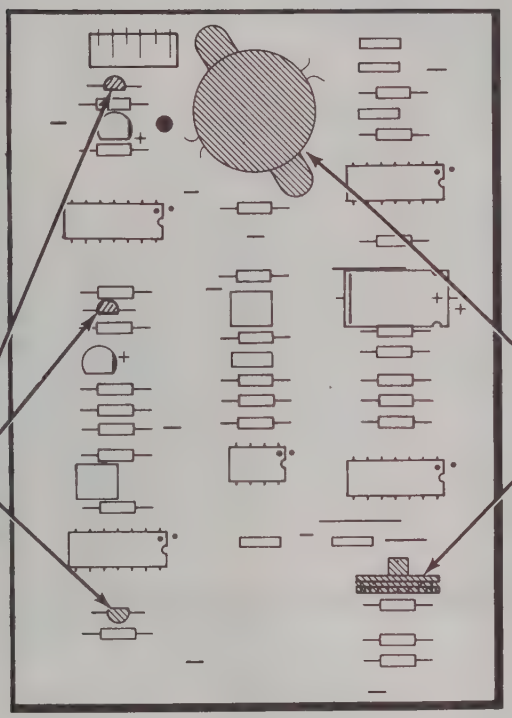
NOTE: As you install transistors in the following steps, be sure to match the flat of the transistor with the flat outline on the circuit board. Solder the leads to the foil and cut off the excess lead lengths.



( ) Q203: B-1097 or GE4936 (no dot) transistor (#417-118).

( ) Q202: B-1097 or GE4936 (no dot) transistor (#417-118).

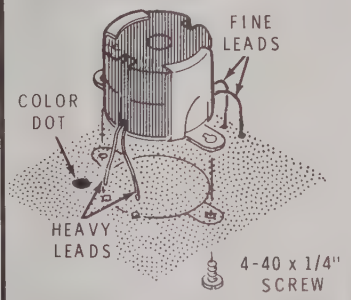
( ) Q201: B-1098 or GE1691 (white dot) transistor (#417-201).



PICTORIAL 2-4

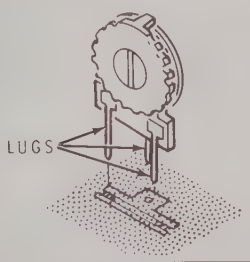
CONTINUE

IMPORTANT: Look carefully at the 40 kHz transformer (#230-1513) and notice that it has two fine leads and two heavy leads. When you install the transformer in the following step, make sure you insert the **heavy** leads into the holes nearest the color dot on the circuit board. Disregard the color dot on the transformer.



( ) T201: Insert the transformer leads through the circuit board holes. Mount the transformer with two 4-40 × 1/4" screws. Then solder the leads to the foil and cut off the excess lead lengths.

( ) R212: 5000 Ω (5K) control. Solder the lugs to the foil.



CIRCUIT BOARD CHECKOUT

Carefully inspect the circuit board for the following conditions. NOTE: The IC's will be installed after "Circuit Board Checkout."

( ) Unsoldered connections.

( ) Transistors and IC's for the proper type and installation.

( ) Electrolytic capacitors for the correct position of the positive (+) end.

( ) "Cold" solder connections.

( ) Solder bridges between foil patterns.

( ) Protruding leads which could touch together.

FINISH

START

CAUTION: Some of the following IC's are extremely delicate and can be damaged by static electricity if they are not handled properly. Refer to the following five steps and install the IC exactly as instructed.

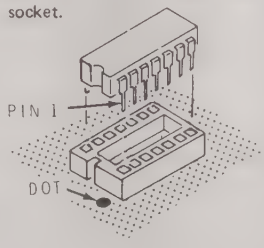
1. Pick up the IC holder in one hand and remove the IC with the other hand. Once the IC has been removed from the holder, do not lay the IC down or let its pins touch any object.

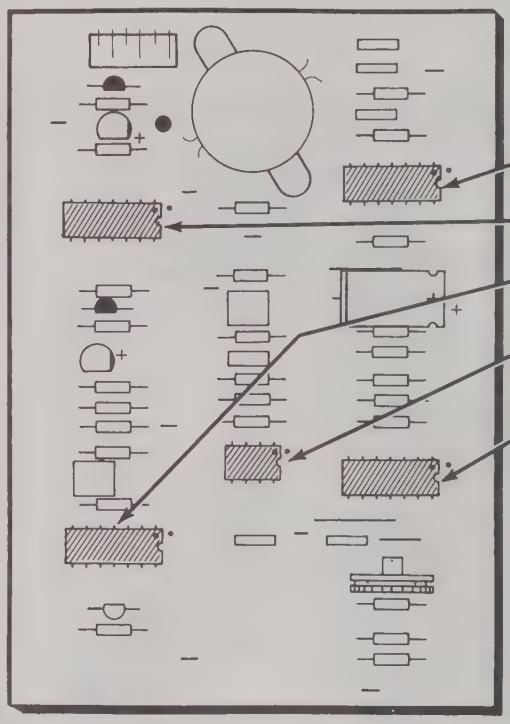
2. Check the IC pins to make sure they are straight. NOTE: It is alright to use a pair of pliers to straighten an IC pin as long as you hold the pliers in one hand and the IC in the other hand.

3. Refer to Detail 2-5A and identify pin 1.

4. Pick up the circuit board in your free hand and allow the foil to make contact with your hand.

5. Align pin 1 of the IC with the dot on the circuit board and start the IC pins into the socket. Make sure each pin is going into the socket, then gently push the IC down into the socket.





CONTINUE

( ) A201: CA3600E or CD4007AE IC.

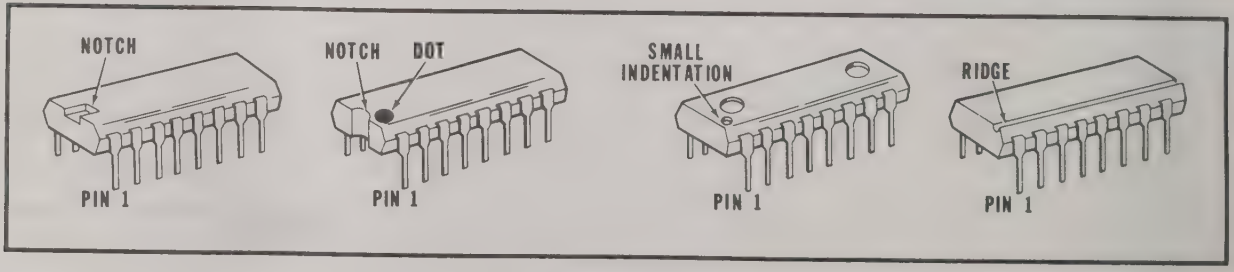
( ) A202: CD4001AE IC.

( ) A204: CA3086 IC.

( ) A205: A-1060 IC. NOTE: This IC is not in the holder and does not require special handling.

( ) A203: CA3600E or CD4007AE IC.

PICTORIAL 2-5



Detail 2-5A

SCREAMER CIRCUIT BOARD

PARTS LIST

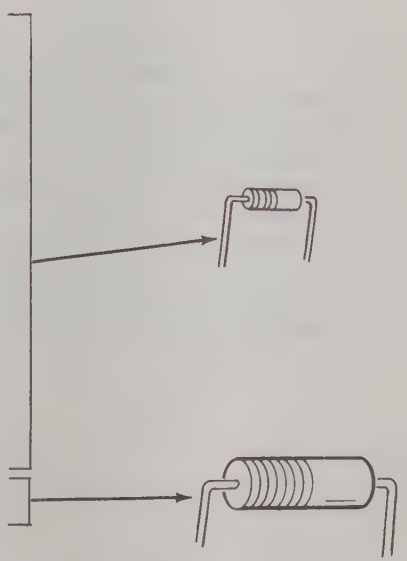
Locate the parts pack marked 1153. Check each part in the pack against the following list. Make a check (✓) in the space provided as you identify each part. Do not throw away any packing material until all parts are accounted for.

To order a replacement part, use the Parts Order Form furnished with this kit. If a Parts Order Form is not available, refer to "Replacement Parts" inside the rear cover of the Manual. For pricing information, refer to the separate "Heath Parts Price List."

RESISTORS

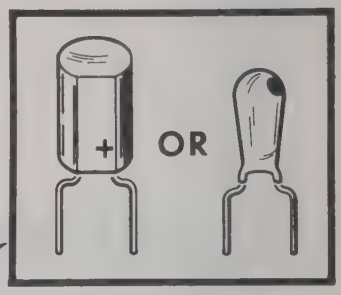
NOTE: The following resistors are all 1/4-watt*. A gold fourth band indicates 5% tolerance; a silver fourth band indicates 10% tolerance.

QTY.		DESCRIPTION	PART No.	CIRCUIT Component No.
( )	2	1000 Ω (brown-black-red)	1-69-12	R320, R322
( )	5	10 kΩ (brown-black-orange)	1-80-12	R311, R313, R315, R321, R323
( )	2	22 kΩ (red-red-orange)	1-91-12	R314, R318A
( )	2	47 kΩ (yellow-violet-orange)	1-83-12	R318B, R319
( )	2	100 kΩ (brown-black-yellow)	1-84-12	R304, R309
( )	11	470 kΩ (yellow-violet-yellow)	1-86-12	R301, R302, R303, R305, R306, R307, R308, R310, R312, R316, R317
( )	1	33 Ω (orange-orange-black), 2-watt	1-14-1	R324



*Resistors ordered as replacement parts may be a larger physical size than the resistors supplied with this kit.

QTY.	DESCRIPTION	PART No.	CIRCUIT Component No.

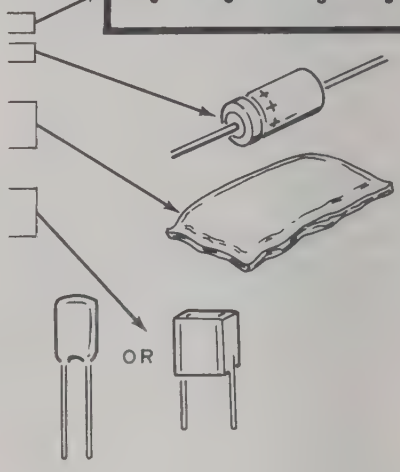


CAPACITORS

( )	2	10 μF electrolytic	25-257	C301, C304
( )	2	47 μF electorlytic	25-98	C305, C306

NOTE: The following block capacitors may be packed inside a piece of protective packing as shown at the right.

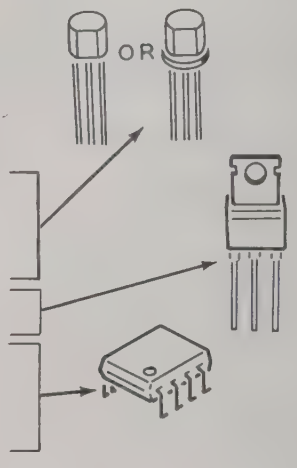
( )	1	.010 μF (10n) block	230-624	C303
( )	1	.1 μF block	230-623	C302



TRANSISTORS-IC's (Integrated Circuits)

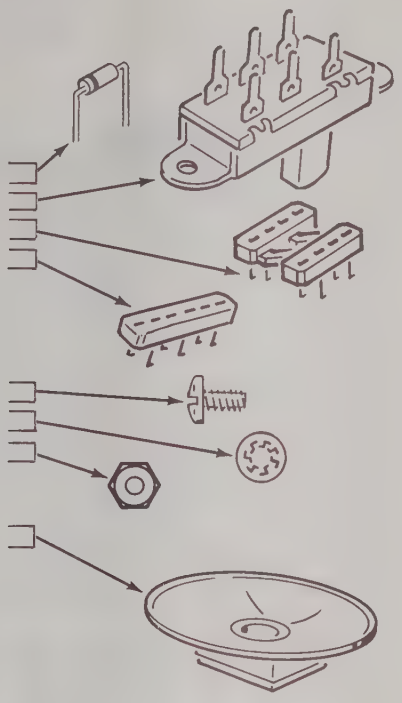
NOTE: Transistors and IC's (Integrated Circuits) are marked for identification in one of the following ways. For further information on transistor identification, refer to the Semiconductor Identification Chart on Page 90.

1. Type number.
2. Color dot and type number.
3. Color dot and type number other than the one listed.



( )	3	B-1101 or GE-5508 (red dot) transistor	417-94	Q302, Q304, Q306
( )	2	B-1098 or GE-1691 (white dot) transistor	417-201	Q301, Q303
( )	2	64566 (2N6106) transistor	230-1503	Q305, Q307
( )	1	A-1060 or 741 8-pin IC	442-22	A302
( )	1	A-1061 or A-1325 8-pin IC	442-21	A301

	QTY.	DESCRIPTION	PART No.	CIRCUIT Component No.
GENERAL				
( )	1	1N4454 diode	56-56	D301
( )	1	6-lug slide switch	60-21	SW301
( )	2	8-pin IC socket	434-266	
( )	1	6-pin connector	230-1522	
( )	3"	Small bare wire (#22)	340-8	
PARTS FROM FINAL PACK				
( )	2	6-32 x 1/4" screw	250-56	
( )	2	#6 lockwasher	254-1	
( )	2	6-32 nut	252-3	
( )	1	Screamer circuit board (1153)	230-1517	
( )	1	Speaker	230-1518	



STEP-BY-STEP ASSEMBLY

START

Locate the screamer circuit board (#1153) and position it on your work surface as shown. Then complete the following steps.

( ) R314: 22 kΩ (red-red-orange).

( ) R319: 47 kΩ (yellow-violet-orange).

( ) R318B: 47 kΩ (yellow-violet-orange).

( ) R318A: 22 kΩ (red-red-orange).

( ) R313: 10 kΩ (brown-black-orange).

( ) R315: 10 kΩ (brown-black-orange).

( ) R311: 10 kΩ (brown-black-orange).

( ) R312: 470 kΩ (yellow-violet-yellow).

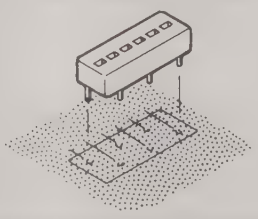
( ) R317: 470 kΩ (yellow-violet-yellow).

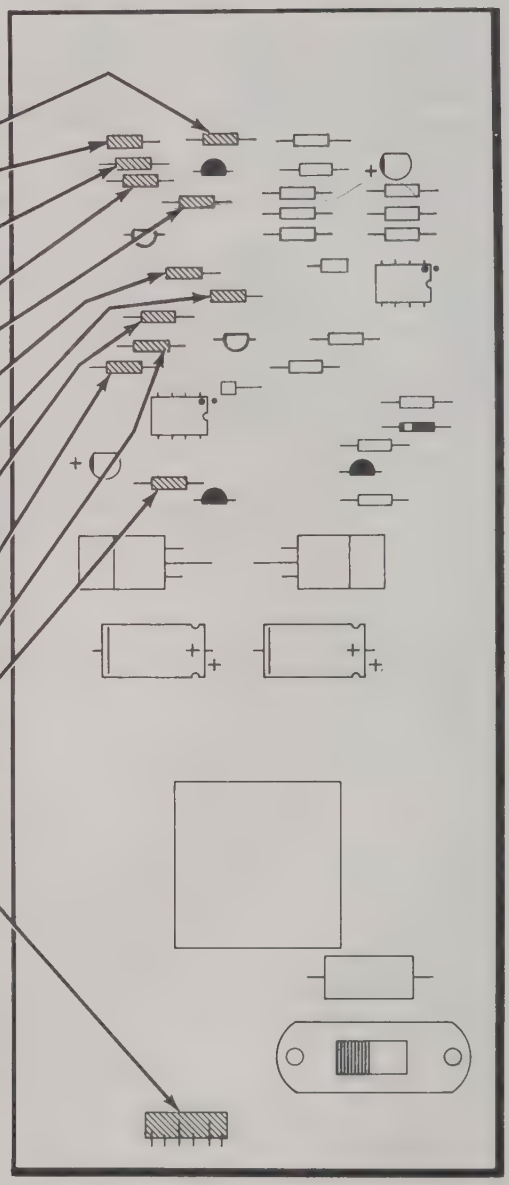
( ) R316: 470 kΩ (yellow-violet-yellow).

( ) R320: 1000 Ω (brown-black-red).

( ) Solder the leads to the foil and cut off the excess lead lengths.

( ) Install a 6-pin socket at connector #3. Solder the pins to the foil.





PICTORIAL 3-1

START

( ) R309: 100 kΩ (brown-black-yellow).

( ) R304: 100 kΩ (brown-black-yellow).

( ) R301: 470 kΩ (yellow-violet-yellow).

( ) R305: 470 kΩ (yellow-violet-yellow).

( ) R307: 470 kΩ (yellow-violet-yellow).

( ) R302: 470 kΩ (yellow-violet-yellow).

( ) R306: 470 kΩ (yellow-violet-yellow).

( ) R303: 470 kΩ (yellow-violet-yellow).

( ) R308: 470 kΩ (yellow-violet-yellow).

( ) R310: 470 kΩ (yellow-violet-yellow).

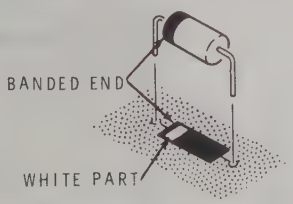
( ) Solder the leads to the foil and cut off the excess lead lengths.

( ) R321: 10 kΩ (brown-black-orange).

( ) R322: 1000 Ω (brown-black-red).

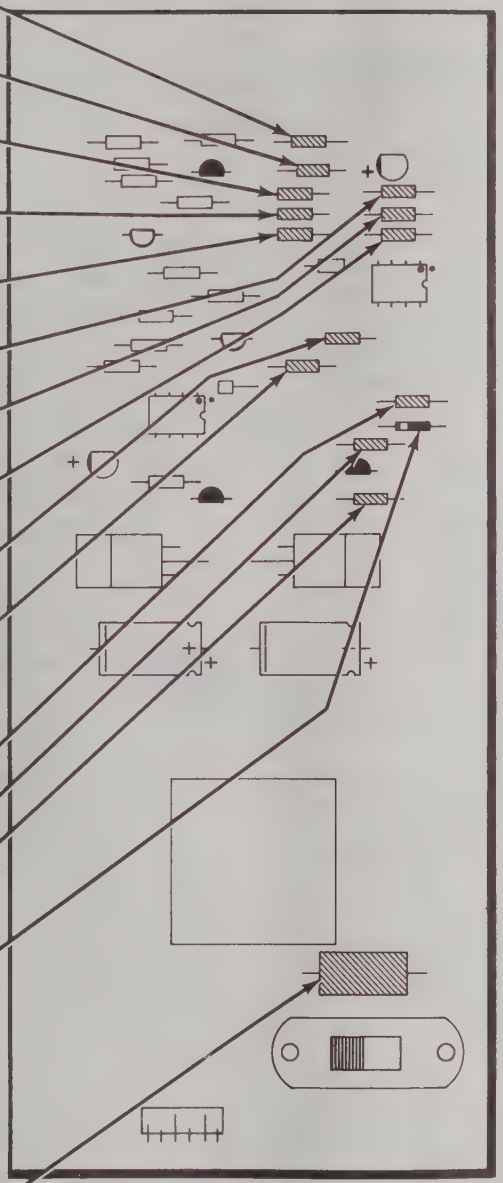
( ) R323: 10 kΩ (brown-black-orange).

( ) D301: 1N4454 diode. Be sure to position the banded end as shown on the circuit board.



( ) R324: 33 Ω, 10%, 2-watt (orange-orange-black).

( ) Solder the leads to the foil and cut off the excess lead lengths.



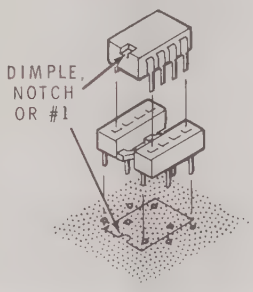
PICTORIAL 3-2

START

NOTE: Install IC sockets and IC's in the following manner.

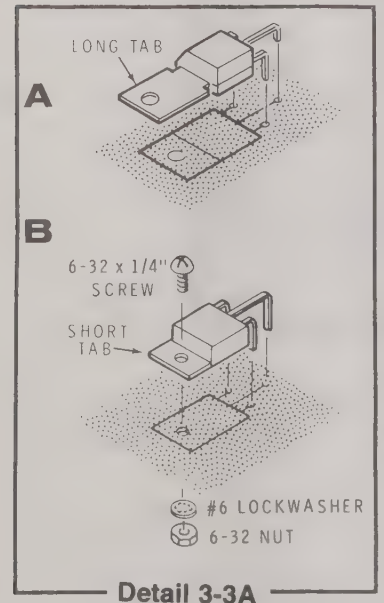
1. First, install the socket on the circuit board and solder the pins to the foil.

2. Then, install the IC into the socket. Note that one end of each IC has an identification mark on it. This may be a notch, a small dimple, or the number 1. Position the IC so the identification mark is positioned toward the dot on the circuit board.

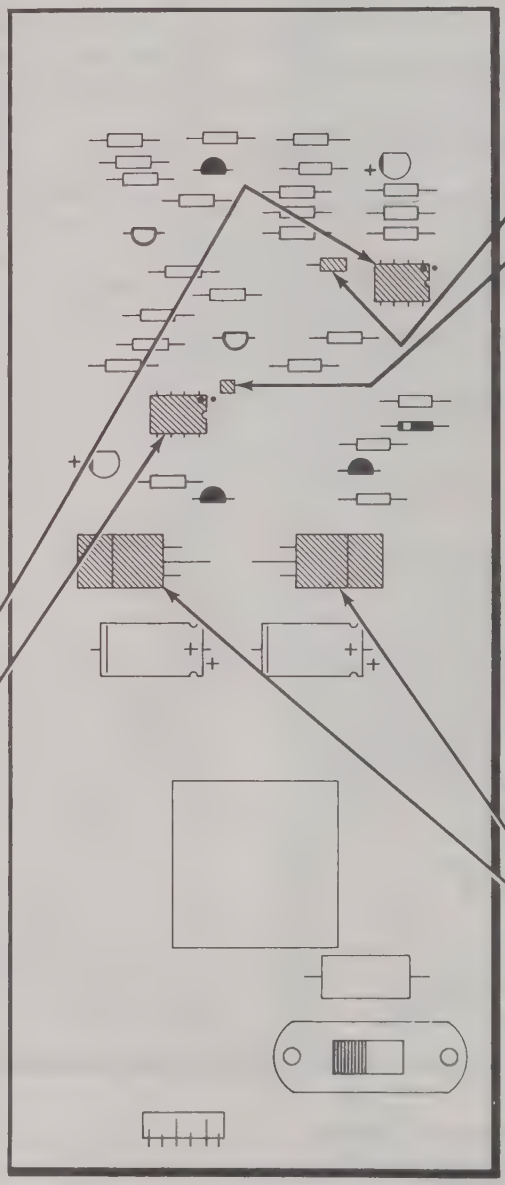


( ) A301: 8-pin IC socket and an A-1325 or A-1061 IC.

( ) A302: 8-pin IC socket and an A-1060 IC or 741 IC.



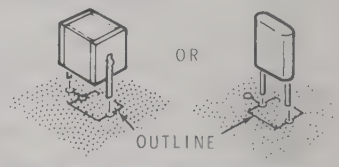
Detail 3-3A



PICTORIAL 3-3

CONTINUE

NOTE: The following block capacitors can be one of two types. Always mount the capacitor over the outline on the circuit board and use the holes that fit the capacitor lead spacing.

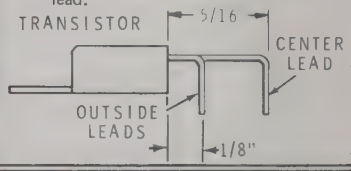


( ) C302: .1 μF block.

( ) C303: .010 μF (10n) block.

( ) Solder the leads to the foil and cut off the excess lead lengths.

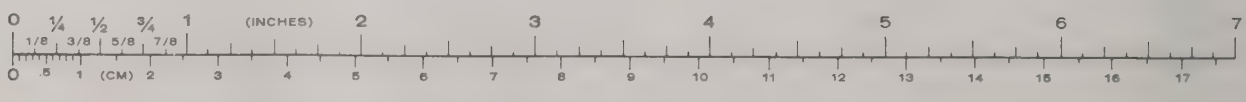
( ) Locate two 64566 (2N6106) transistors (#230-1503) and bend the leads as shown. NOTE: Hold the lead next to the transistor with a pair of pliers when you bend the lead.



NOTE: Refer to Detail 3-3A. Part A or B (depending on which transistor you received) and install the transistor. Note that the transistor in Part A is not mounted with hardware. Then solder the leads to the foil and cut off the excess lead lengths.

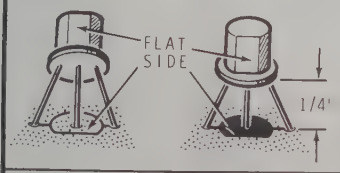
( ) Q307: 64566 transistor.

( ) Q305: 64566 transistor.



START

NOTE: As you install each of the following transistors, be sure to line up the flat of the transistor with the outline of the flat on the circuit board. Solder the leads to the foil and cut off the excess lead lengths.



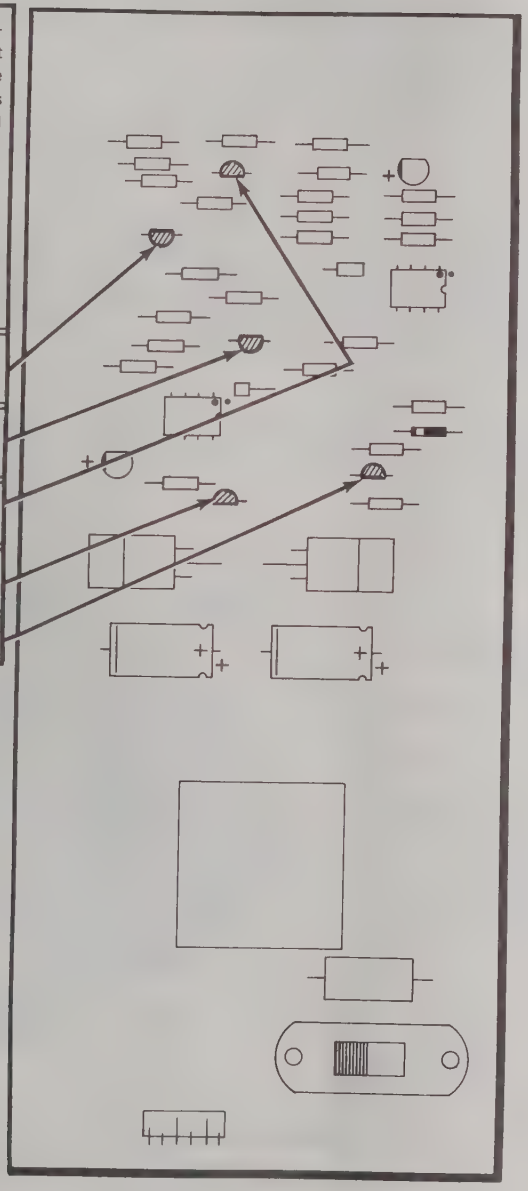
( ) Q303: B-1098 or GE-1691 (white dot) transistor.

( ) Q301: B-1098 or GE-1691 (white dot) transistor.

( ) Q302: B-1101 or GE-5508 (red dot) transistor.

( ) Q304: B-1101 or GE-5508 (red dot) transistor.

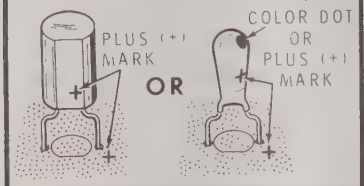
( ) Q306: B-1101 (red dot) transistor.



PICTORIAL 3-4

START

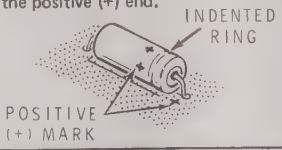
NOTE: When you install electrolytic capacitors, be sure to match the plus (+) mark or color dot on the capacitor with the plus (+) mark on the circuit board as shown.



( ) C301: 10 μF electrolytic.

( ) C304: 10 μF electrolytic.

NOTE: When you install the next two electrolytic capacitors, be sure to position the plus (+) marked end as shown on the circuit board. Also note the indented ring around the positive (+) end.

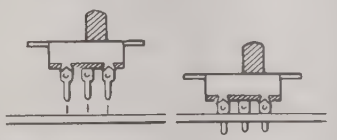


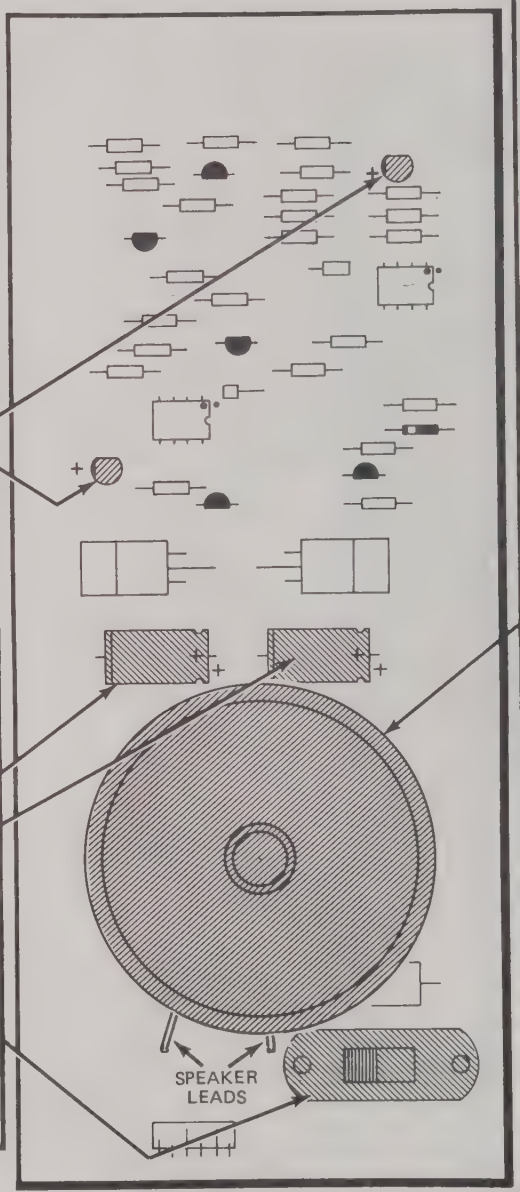
( ) C306: 47 μF electrolytic.

( ) C305: 47 μF electrolytic.

( ) Solder the leads to the foil and cut off the excess lead lengths.

( ) SW301: 6-lug slide switch. Solder the lugs to the foil.



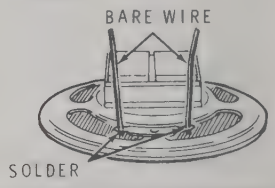


PICTORIAL 3-5

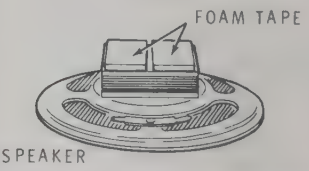
CONTINUE

( ) Cut two 1" lengths of small bare wire.

( ) Solder one end of each length of bare wire to one of the speaker lugs. Insert only enough of the end of the bare wire through the lug so you can solder it.



( ) Remove the protective paper backing from the foam tape on the back of the speaker.



( ) Insert the speaker wires through the circuit board and press the speaker against the circuit board in the outline.

( ) Solder the speaker wires to the foil and cut off any excess lead lengths.

CIRCUIT BOARD CHECKOUT

Carefully inspect the circuit board for the following conditions.

( ) Unsoldered connections.

( ) Transistors and IC's for the proper type and installation.

( ) Electrolytic capacitors for the correct position of the positive (+) end.

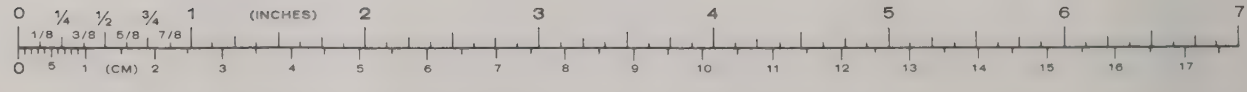
( ) "Cold" solder connections.

( ) Solder bridges between foil pattern.

( ) Protruding leads which could touch together.

( ) Diodes for the correct position of the banded end.

FINISH



PROCESSOR CIRCUIT BOARD

PARTS LIST

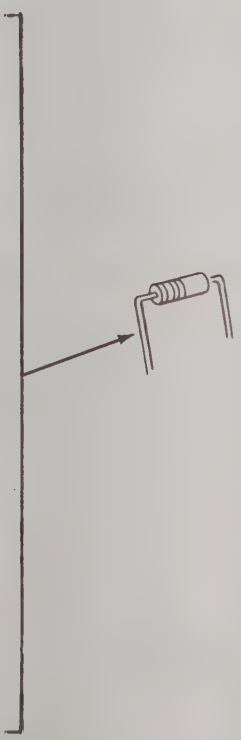
Locate the parts pack marked 1185. Check each part in the pack against the following list. Make a check (✓) in the space provided as you identify each part. Do not throw away any packing material until all parts are accounted for.

To order a replacement part, use the Parts Order Form furnished with this kit. If a Parts Order Form is not available, refer to "Replacement Parts" inside the rear cover of the Manual. For pricing information, refer to the separate "Heath Parts Price List."

RESISTORS

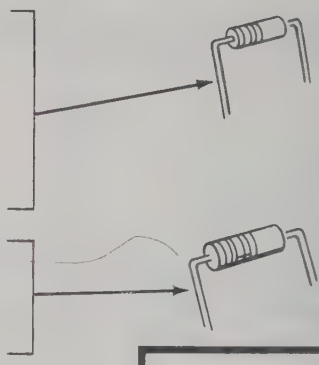
NOTE: The following resistors are all 1/4-watt*. A gold fourth band indicates 5% tolerance; a silver fourth band indicates 10% tolerance.

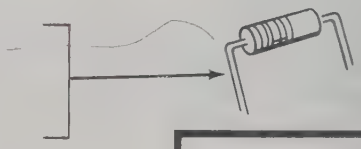
QTY.	DESCRIPTION	PART No.	CIRCUIT Component No.
( ) 1	47 Ω (yellow-violet-black)	1-58-12	R403
( ) 2	100 Ω (brown-black-brown)	1-60-12	R454, R457
( ) 6	1000 Ω (brown-black-red)	1-69-12	R401, R402, R422, R424, R433, R456
( ) 6	2200 Ω (red-red-red)	1-72-12	R409, R411, R414, R416, R429, R452
( ) 5	4700 Ω (yellow-violet-red)	1-76-12	R407, R418 R420, R434, R455
( ) 5	10 kΩ (brown-black-orange)	1-80-12	R405, R408, R410, R443, R453
( ) 4	22 kΩ (red-red-orange)	1-91-12	R419, R427, R430, R441
( ) 5	47 kΩ (yellow-violet-orange)	1-83-12	R412, R426, R428, R446, R451
( ) 7	100 kΩ (brown-black-yellow)	1-84-12	R406, R421, R432, R436, R445, R440, R449

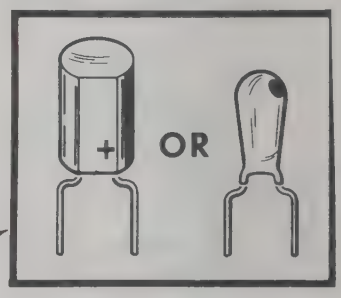


*Resistors ordered as replacement parts may be a larger physical size than the resistors supplied with this kit.

QTY.		DESCRIPTION	PART No.	CIRCUIT Component No.
Resistors (cont'd.)				
( )	3	220 kΩ (red-red-yellow)	1-38-12	R413, R417, R439
( )	4	470 kΩ (yellow-violet-yellow)	1-86-12	R431, R438, R447, R448
( )	2	1 MΩ (brown-black-green)	1-87-12	R404, R423
( )	2	2.2 MΩ (red-red-green)	1-37-12	R425, R437
( )	1	47 Ω (yellow-violet-black) 1/2-watt	1-145	R442
( )	2	10 MΩ (brown-black-blue) 1/2-watt	1-166	R435, R444





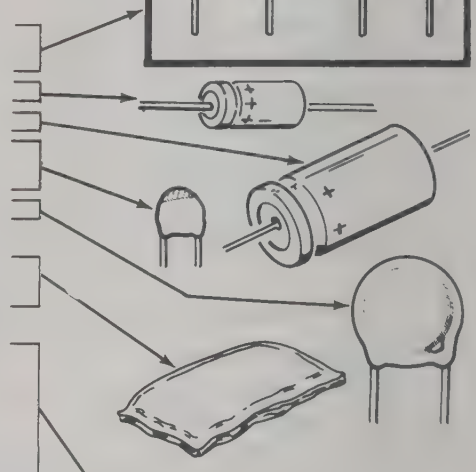


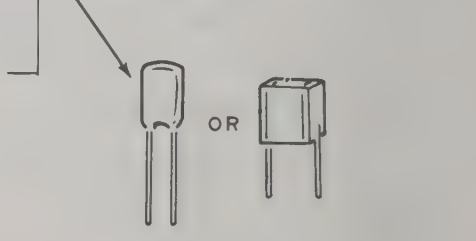
CAPACITORS

( )	3	10 μF electrolytic	25-257	C410, C415, C419
( )	2	47 μF electrolytic	25-98	C406, C422
( )	1	470 μF electrolytic	230-621	C405
( )	3	330 pF disc	230-1510	C411, C420, C421
( )	1	.0047 μF disc	21-72	C403

NOTE: The following block capacitors may be packed inside a piece of protective packing as shown at the right.

( )	6	.010 μF (10n) block	230-624	C407, C409, C413, C414, C417, C418
( )	3	.1 μF block	230-623	C401, C402, C404
( )	3	.47 μF block	230-1507	C408, C412, C416



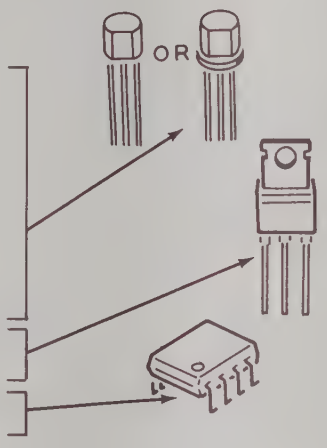


QTY.		DESCRIPTION	PART No.	CIRCUIT Component No.

TRANSISTORS-IC's (Integrated Circuits)

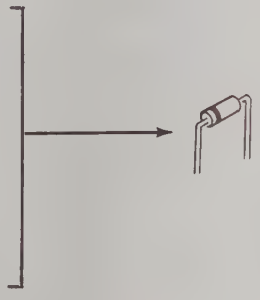
NOTE: Transistors and IC's (Integrated Circuits) are marked in one of the following ways: For further information on transistor identification, refer to the Semiconductor Identification Chart on Page 90.

1. Type number.
2. Color dot and type number.
3. Color dot and type number other than the one listed.



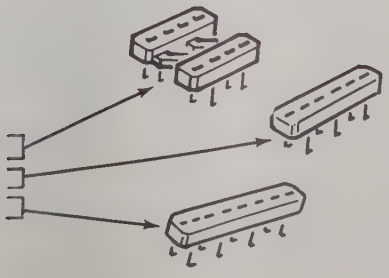
( )	1	B-1101 or GE-5508 (red dot) transistor	417-94	Q405
( )	5	B-1098 or GE-1691 (white dot) transistor	417-201	Q401,Q409, Q411,Q413, Q414
( )	8	B-1097 or GE-4936 (no dot) transistor	417-118	Q402,Q403, Q407,Q408, Q410,Q412, Q404, Q415
( )	1	64566 (2N6106) transistor	230-1503	Q406
( )	3	A1060 or 741 8-pin IC	442-22	A401, A402, A403

DIODES



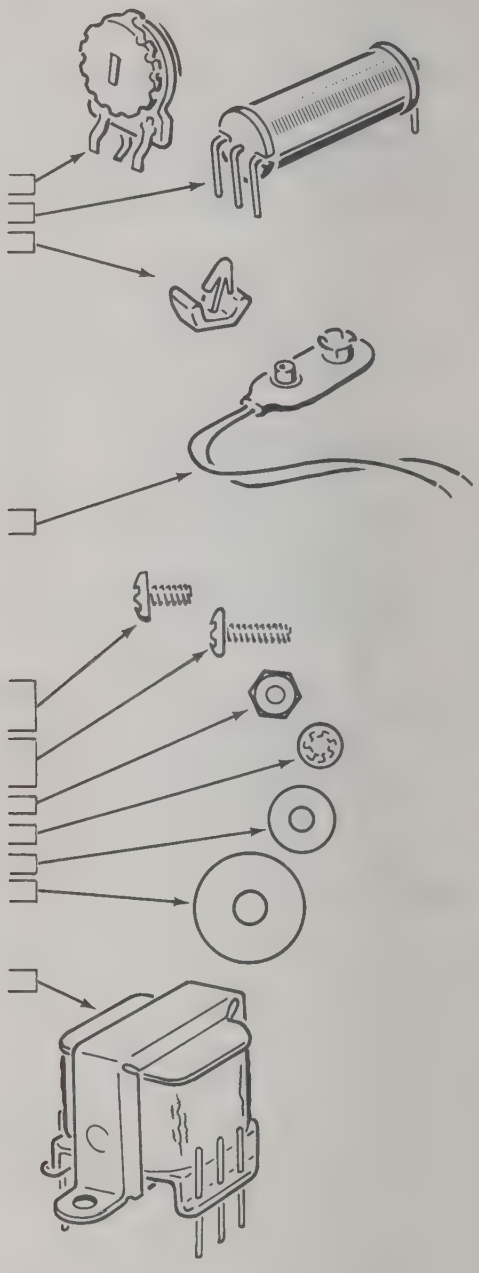
( )	9	1N4454	56-56	D401, D402, D407, D411, D412, D413, D416, D417, D418
( )	2	1N34	56-26	D403, D404
( )	1	1N762 zener	56-63	D410
( )	6	SCE I	57-65	D405, D406, D408, D409, D414, D415

SOCKET-CONNECTORS



( )	3	8-pin IC socket	434-266
( )	3	6-pin connector	230-1522
( )	1	8-pin connector	230-1524

	QTY.	DESCRIPTION	PART No.	CIRCUIT Component No.
GENERAL				
( )	1	2 kΩ control	10-398	R415
( )	1	Relay	230-1504	
( )	1	Nylon button	230-1505	
PARTS FROM FINAL PACK				
( )	2	Battery connector	432-33	
( )	1	Stranded wire (fuse) #24 (19 x 36)	344-90	
( )	1	Line cord	89-13	
( )	1	6-32 x 1/4" phillips head screw	250-56	
( )	2	6-32 x 3/8" phillips head screw	250-89	
( )	3	6-32 nut	252-3	
( )	3	#6 lockwasher	254-1	
( )	2	#6 flat washer	253-60	
( )	2	Nylon flat washer	253-6	
( )	1	Processor circuit board (1185)	230-1502	
( )	1	Power transformer	230-1530	T401



STEP-BY-STEP ASSEMBLY

START

Locate the processor circuit board (#1185) and position it on your work surface as shown. Then complete the following steps.

( ) R404: 1 MΩ (brown-black-green).

( ) R411: 2200 Ω (red-red-red).

( ) R416: 2200 Ω (red-red-red).

( ) R455: 4700 Ω (yellow-violet-red).

( ) R457: 100 Ω (brown-black-brown).

( ) R454: 100 Ω (brown-black-brown).

( ) R453: 10 kΩ (brown-black-orange).

( ) R419: 22 kΩ (red-red-orange).

( ) Solder the leads to the foil and cut off the excess lead lengths.

( ) R421: 100 kΩ (brown-black-yellow).

( ) R423: 1 MΩ (brown-black-green).

( ) R429: 2200 Ω (red-red-red).

( ) R435: 10 MΩ, 1/2-watt (brown-black-blue).

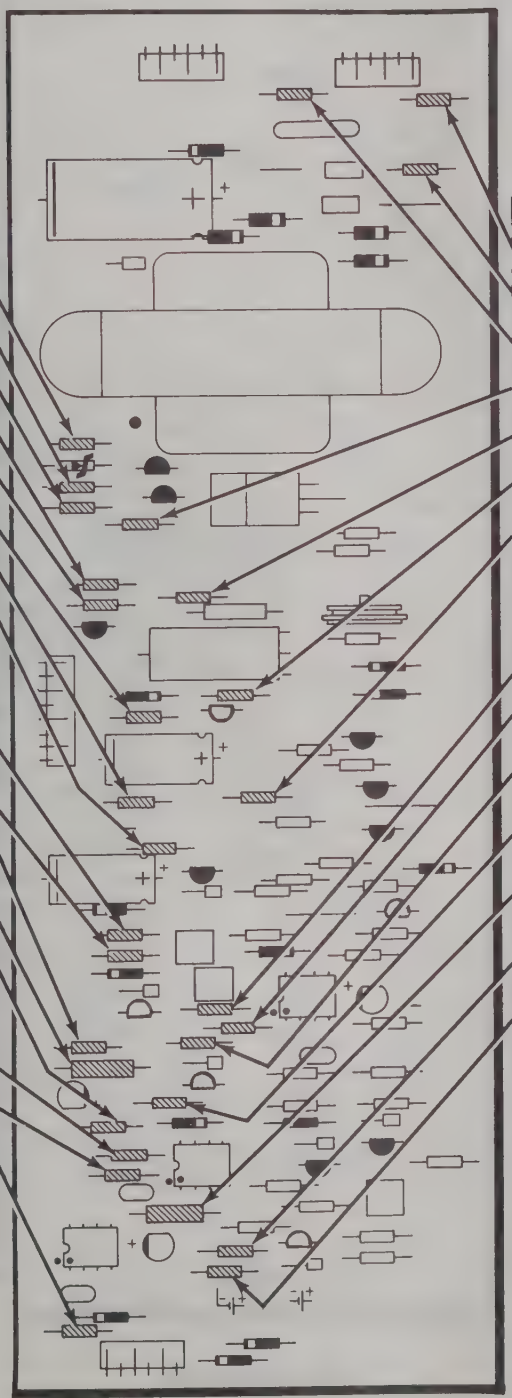
( ) R447: 470 kΩ (yellow-violet-yellow).

( ) R445: 100 kΩ (brown-black-yellow).

( ) R446: 47 kΩ (yellow-violet-orange).

( ) R448: 470 kΩ (yellow-violet-yellow).

( ) Solder the leads to the foil and cut off the excess lead lengths.



CONTINUE

( ) R412: 47 kΩ (yellow-violet-orange).

( ) R403: 47 Ω (yellow-violet-black).

( ) R418: 4700 Ω (yellow-violet-red).

( ) R409: 2200 Ω (red-red-red).

( ) R456: 1000 Ω (brown-black-red).

( ) R452: 2200 Ω (red-red-red).

( ) R406: 100 kΩ (brown-black-yellow).

( ) Solder the leads to the foil and cut off the excess lead lengths.

( ) R430: 22 kΩ (red-red-orange).

( ) R424: 1000 Ω (brown-black-red).

( ) R432: 100 kΩ (brown-black-yellow).

( ) R434: 4700 Ω (yellow-violet-red).

( ) R444: 10 MΩ, 1/2-watt (brown-black-blue).

( ) R449: 100 kΩ (brown-black-yellow).

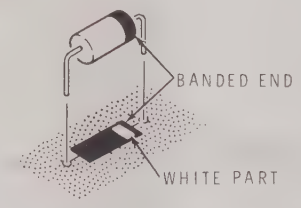
( ) R451: 47 kΩ (yellow-violet-orange).

( ) Solder the leads to the foil and cut off the excess lead lengths.

PICTORIAL 4-1

START

NOTE: When you install the following diodes, be sure to position the banded end of the diode as shown on the circuit board.



( ) D414: SCEI diode.

( ) D405: SCEI diode.

( ) D406: SCEI diode.

( ) D408: SCEI diode.

( ) D409: SGEI diode.

( ) Solder the leads to the foil and cut off the excess lead lengths.

( ) R442: 47 Ω, 1/2-watt (yellow-violet-black).

( ) R407: 4700 Ω (yellow-violet-red).

( ) R438: 470 kΩ (yellow-violet-yellow).

( ) R417: 220 kΩ (red-red-yellow).

( ) D415: SCEI diode. Be sure to position the banded end as shown on the circuit board.

( ) R420: 4700 Ω (yellow-violet-red).

( ) R422: 1000 Ω (brown-black-red).

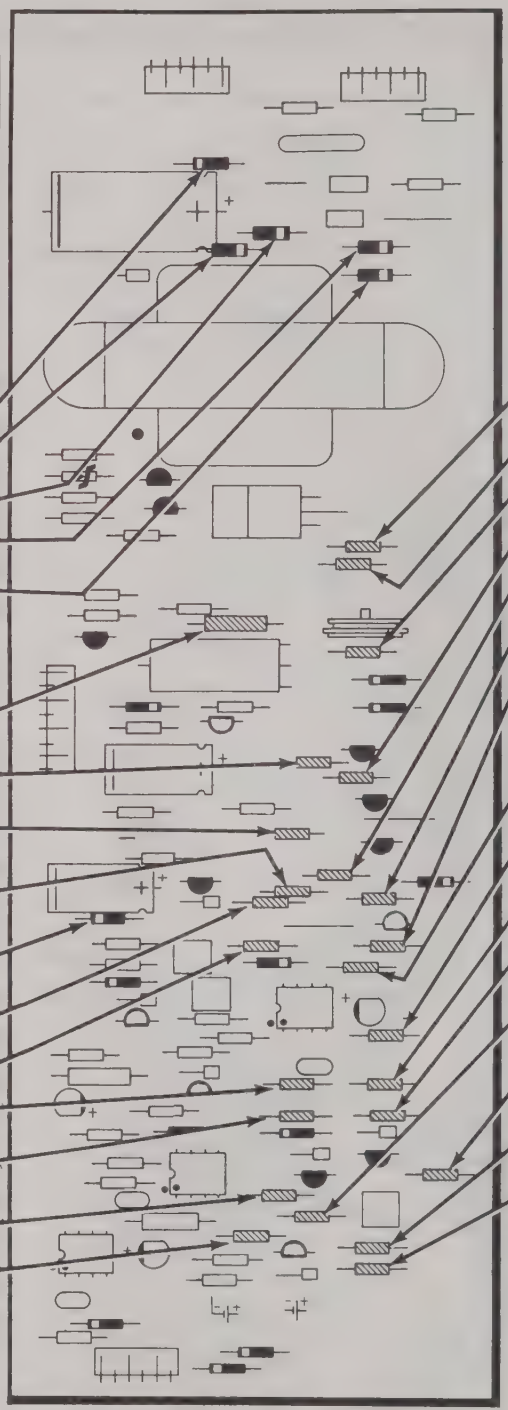
( ) R426: 47 kΩ (yellow-violet-orange).

( ) R431: 470 kΩ (yellow-violet-yellow).

( ) R433: 1000 Ω (brown-black-red).

( ) R443: 10 kΩ (brown-black-orange).

( ) Solder the leads to the foil and cut off the excess lead lengths.



CONTINUE

( ) R408: 10 kΩ (brown-black-orange).

( ) R410: 10 kΩ (brown-black-orange).

( ) R414: 2200 Ω (red-red-red).

( ) R405: 10 kΩ (brown-black-orange).

( ) R413: 220 kΩ (red-red-yellow).

( ) R401: 1000 Ω (brown-black-red).

( ) R402: 1000 Ω (brown-black-red).

( ) Solder the leads to the foil and cut off the excess lead lengths.

( ) R428: 47 kΩ (yellow-violet-orange).

( ) R425: 2.2 MΩ, 10% (red-red-green-silver).

( ) R427: 22 kΩ (red-red-orange).

( ) R441: 22 kΩ (red-red-orange).

( ) R436: 100 kΩ (brown-black-yellow).

( ) R437: 2.2 MΩ, 10% (red-red-green-silver).

( ) R439: 220 kΩ (red-red-yellow).

( ) R440: 100 kΩ (brown-black-yellow).

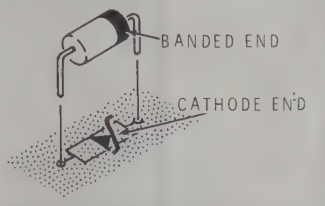
( ) Solder the leads to the foil and cut off the excess lead lengths.

PICTORIAL 4-2

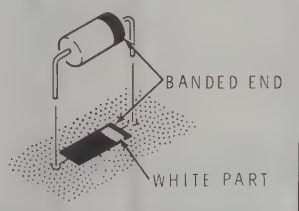
START

( ) D410: 1N762 zener diode.

Be sure to position the banded end of the diode over the cathode end of the outline on the circuit board.



NOTE: When you install the following diodes, be sure to position the banded end of the diode as shown on the circuit board.



( ) D407: 1N4454 diode.

( ) D401: 1N4454 diode.

( ) D418: 1N4454 diode.

( ) D402: 1N4454 diode.

( ) D412: 1N4454 diode.

( ) D411: 1N4454 diode.

( ) D413: 1N4454 diode.

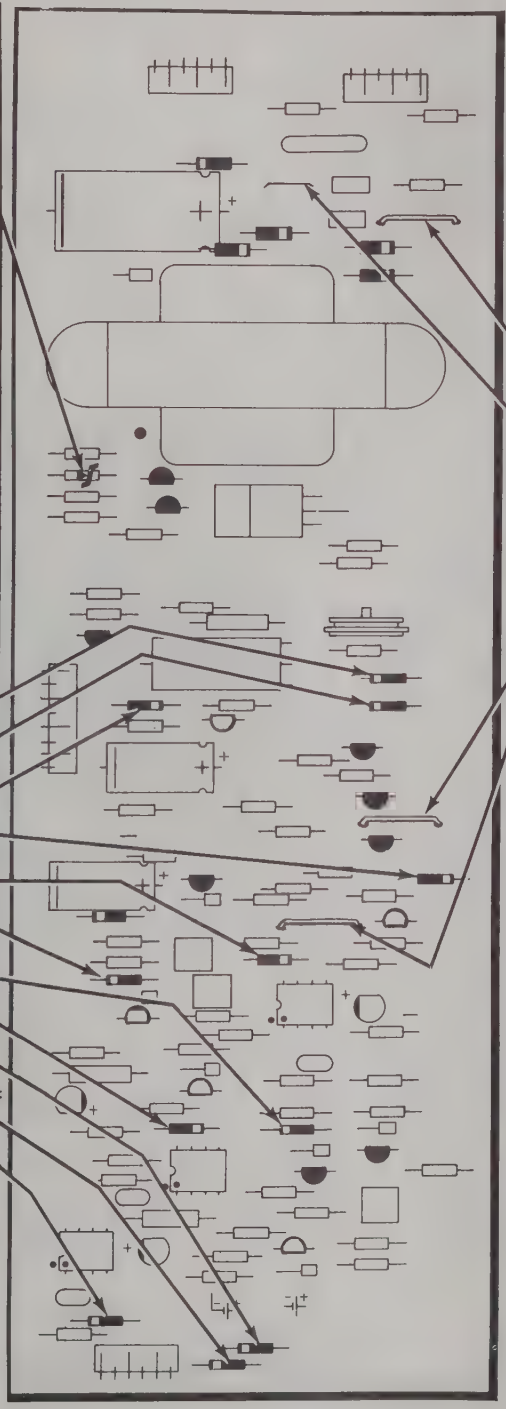
( ) D416: 1N4454 diode.

( ) D404: 1N34 diode.

( ) D403: 1N34 diode.

( ) D417: 1N4454 diode.

( ) Solder the leads to the foil and cut off the excess lead lengths.

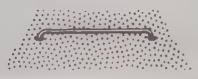


CONTINUE

NOTE: When you install a bare wire, as in the following step, cut the wire to the indicated length. Bend the wire 1/4" from each end, and then mount the wire onto the board. Solder the wire to the foil and cut off the excess lead lengths.

( ) 1" bare wire.

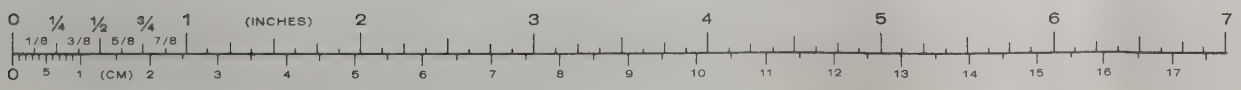
( ) Locate the length of stranded wire. Remove one strand of this wire and insert it into the circuit board holes marked FUSE. Solder the wire to the foil and cut off the excess wire ends. Save the remaining stranded wire for future fuse wires.



( ) 1" bare wire.

( ) 1" bare wire.

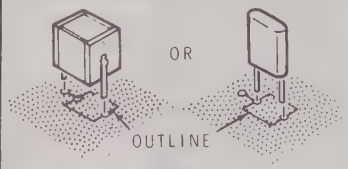
PICTORIAL 4-3



START

( ) C403: .0047 µF disc.

NOTE: Some of the following block capacitors can be one of two types. Always mount the capacitor over the outline on the circuit board and use the holes that fit the capacitor lead spacing.



( ) C404: .1 µF block.

( ) C401: .1 µF block.

( ) C402: .1 µF block.

( ) C407: .010 µF (10n) block.

( ) C408: .47 µF block.

( ) C412: .47 µF block.

( ) C409: .010 µF (10n) block.

( ) C414: .010 µF (10n) block.

( ) Solder the leads to the foil and cut off the excess lead lengths.

( ) C411: 330 pF disc.

( ) C417: .010 µF (10n) block.

( ) C413: .010 µF (10n) block.

( ) C416: .47 µF block.

( ) C420: 330 pF disc.

( ) C418: .010 µF (10n) block.

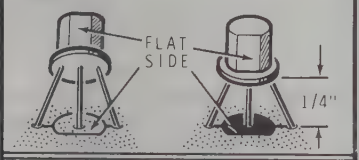
( ) C421: 330 pF disc.

( ) Solder the leads to the foil and cut off the excess lead lengths.

PICTORIAL 4-4

START

NOTE: As you install each of the following transistors, be sure to line up the flat of the transistor with the outline of the flat on the circuit board. Solder the leads to the foil and cut off the excess lead lengths.



( ) Q405: B-1101 or GE-5508 (red dot) transistor.

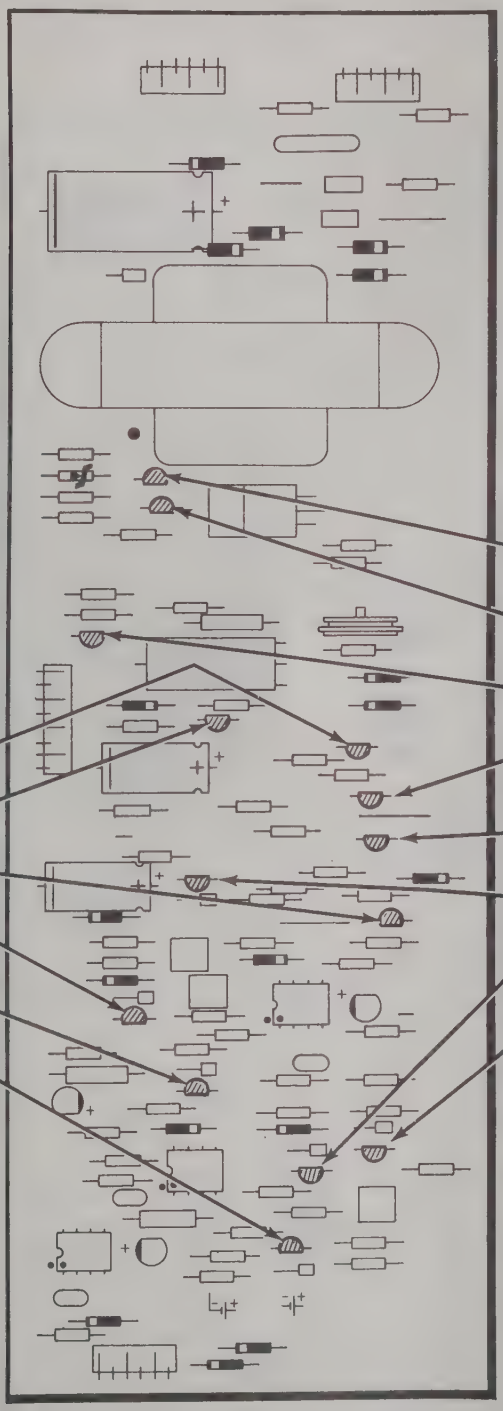
( ) Q414: B-1098 or GE-1691 (white dot) transistor.

( ) Q401: B-1098 or GE-1691 (white dot) transistor.

( ) Q409: B-1098 or GE-1691 (white dot) transistor.

( ) Q411: B-1098 or GE-1691 (white dot) transistor.

( ) Q413: B-1098 or GE-1691 (white dot) transistor.



CONTINUE

( ) Q404: B-1097 or GE-4936 (no dot) transistor.

( ) Q407: B-1097 or GE-4936 (no dot) transistor.

( ) Q415: B-1097 or GE-4936 (no dot) transistor.

( ) Q403: B-1097 or GE-4936 (no dot) transistor.

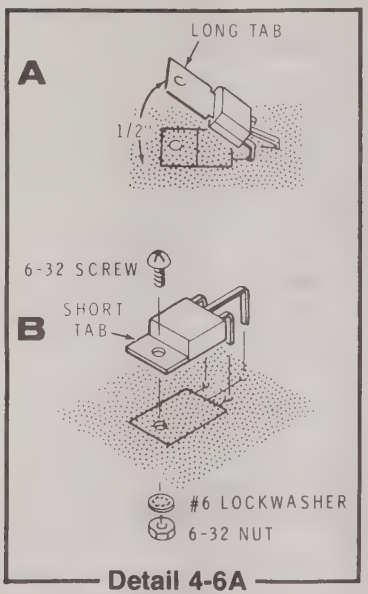
( ) Q402: B-1097 or GE-4936 (no dot) transistor.

( ) Q408: B-1097 or GE-4936 (no dot) transistor.

( ) Q410: B-1097 or GE-4936 (no dot) transistor.

( ) Q412: B-1097 or GE-4936 (no dot) transistor.

PICTORIAL 4-5



Detail 4-6A

START

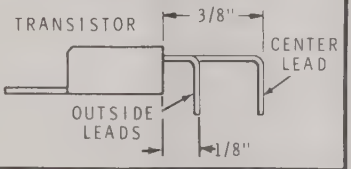
( ) Install a 6-pin socket at connector #3. Solder the pins to the foil.

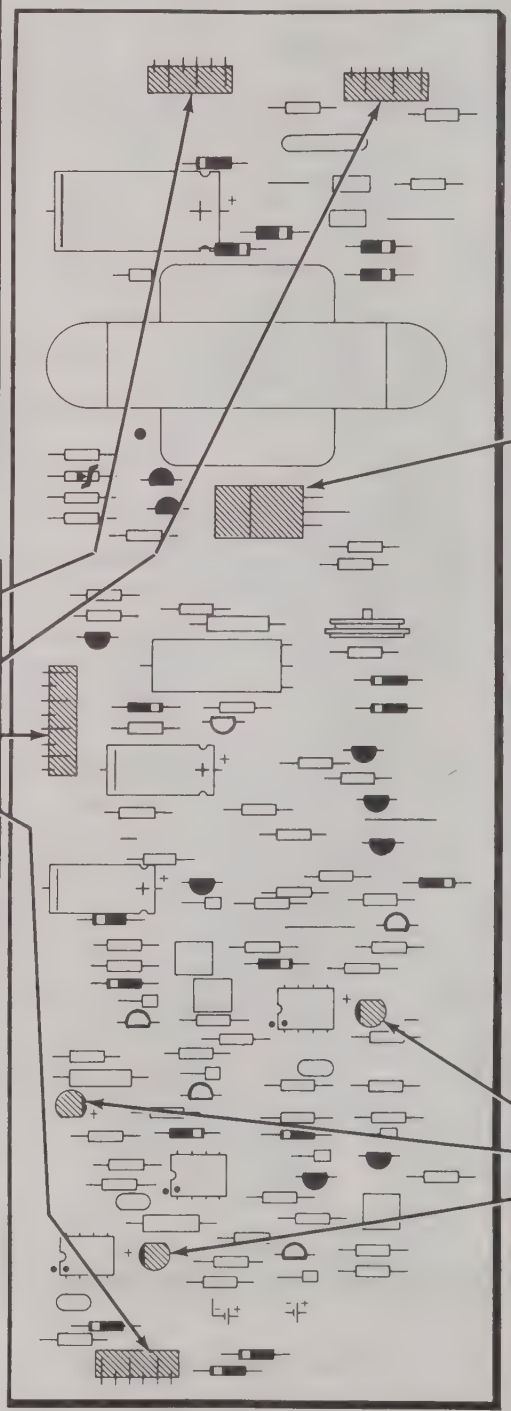
( ) Install a 6-pin socket at connector #4. Solder the pins to the foil.

( ) Install an 8-pin socket at connector #2. Solder the pins to the foil.

( ) Install a 6-pin socket at connector #1. Solder the pins to the foil.

( ) Locate a 64566 transistor and bend the leads as shown. Hold each lead next to the transistor with a pair of pliers when you bend the lead.





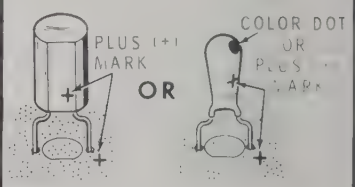
PICTORIAL 4-6

CONTINUE

( ) Q406: 64566 (2N6106) transistor. Refer to Detail 4-6A, Part A or B (depending on which transistor you received) and install the transistor. Note that the transistor in Part A is not mounted with hardware.

( ) Solder the leads of the previously installed transistor to the foil and cut off the excess lead lengths.

NOTE: When you install electrolytic capacitors, be sure to match the plus (+) mark or color dot on the capacitor with the plus (+) mark on the circuit board as shown.

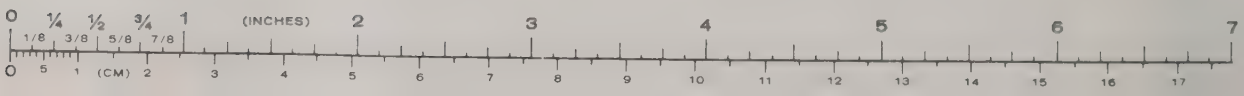


( ) C410: 10 μF electrolytic.

( ) C415: 10 μF electrolytic.

( ) C419: 10 μF electrolytic.

( ) Solder the leads to the foil and cut off the excess lead lengths.

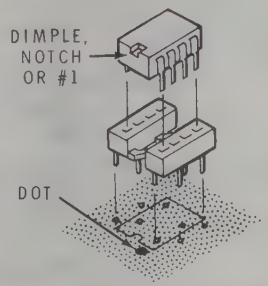


START

NOTE: Install IC sockets and IC's in the following manner.

1. First, install the socket in the circuit board and solder the pins to the foil.

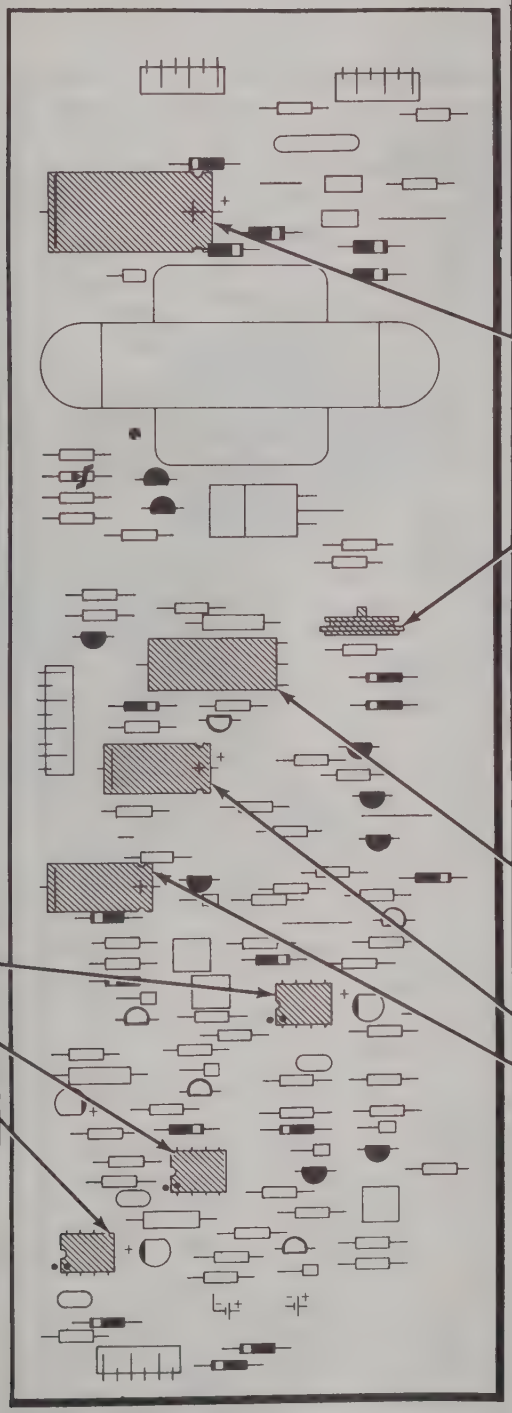
2. Then, install the IC into the socket. Note that one end of each IC has an identification mark on it. This may be a notch, a small dimple, or the number 1. Position the IC so the identification mark is positioned toward the dot on the circuit board.



( ) A401: 8-pin IC socket and an A-1060 IC or 741 IC.

( ) A402: 8-pin IC socket and an A-1060 IC or 741 IC.

( ) A403: 8-pin IC socket and an A-1060 IC or 741 IC.

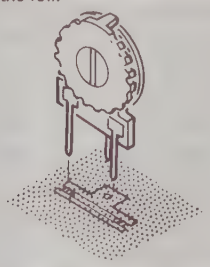


CONTINUE

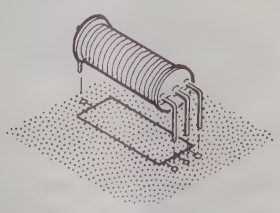
NOTE: As you install the following electrolytic capacitors, be sure to position the plus (+) marked end of the capacitor as shown on the circuit board. Also note the indented ring around the plus (+) end. Solder the leads to the foil and cut off the excess lead lengths.

( ) C405: 470 μF electrolytic.

( ) R415: 2 kΩ control. Solder the lugs to the foil.



( ) Relay: Solder the leads to the foil and cut off the excess lead lengths.



( ) C422: 47 μF electrolytic.

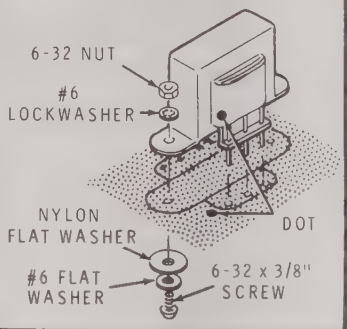
( ) C406: 47 μF electrolytic.

PICTORIAL 4-7

START

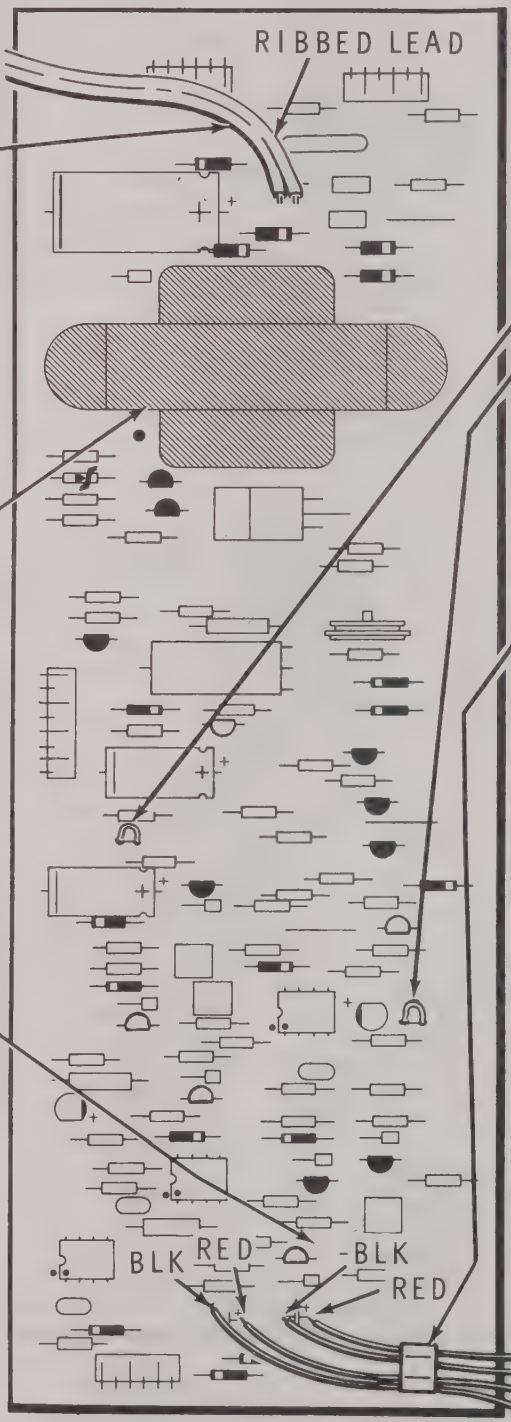
( ) Insert the line cord leads through the circuit board holes marked "115V." Be sure to install the ribbed line cord lead in the indicated hole. Solder the leads to the foil and cut off the excess lead lengths.

( ) T1: Position the transformer on the circuit board so the dot on the transformer matches the dot on the circuit board. Then mount the transformer with two 6-32 x 3/8" screws, two #6 flat washers, two nylon flat washers, two #6 lockwashers, and two 6-32 nuts.



( ) Solder the transformer lugs to the foil.

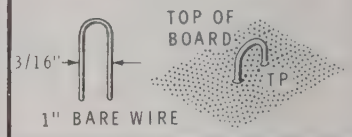
( ) Insert the battery connector wires into the indicated holes in the circuit board and solder them to the foil. Be sure to install the black wires in the minus (-) holes and the red wires in the plus (+) holes.



PICTORIAL 4-8

CONTINUE

( ) Cut two 1" bare wires. Then bend each wire in a "U" shape.

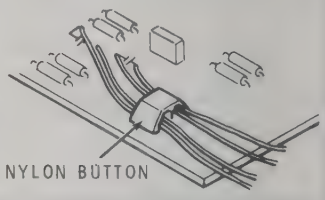


NOTE: In the next two steps, insert the U-shaped wires into the circuit board only far enough so they can be soldered to the foil. Then solder the wires to the foil.

( ) Bare wire at TP5.

( ) Bare wire at TP3.

( ) Push the nylon button into the hole in the circuit board to hold the battery connector wires in place. Place one pair of wires on each side of the button.



Carefully inspect the circuit board for the following conditions. Then set the circuit board aside.

( ) Unsoldered connections.

( ) Transistors for the proper type and installation.

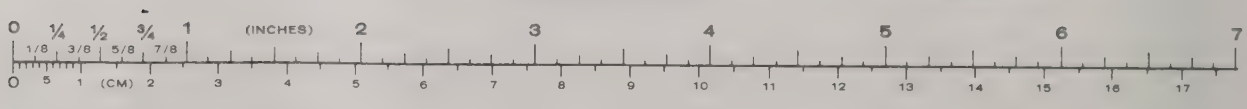
( ) Electrolytic capacitors for the correct position of the positive (+) end.

( ) "Cold" solder connections.

( ) Solder bridges between foil patterns.

( ) Protruding leads which could touch together.

FINISH



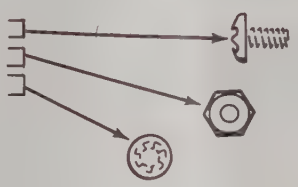
FINAL PACK

PARTS LIST

Locate the final parts pack and check each part against the following list. Make a check (✓) in the space provided as you identify each part. Do not throw away any packing material until all parts are accounted for.

To order a replacement part, use the Parts Order Form furnished with this kit. If a Parts Order Form is not available, refer to "Replacement Parts" inside the rear cover of the Manual. For pricing information, refer to the separate "Heath Parts Price List."

	QTY.	DESCRIPTION	PART No.	CIRCUIT Component No.
HARDWARE				
( )	6	6-32 x 1/4" screw	250-56	
( )	2	6-32 nut	252-3	
( )	2	#6 lockwasher	254-1	
LINE CORD-WIRES-CABLES				
( )	3"	Blue wire	344-21	
( )	3	6-conductor cable	230-1525	
( )	1	8-conductor cable	230-1526	

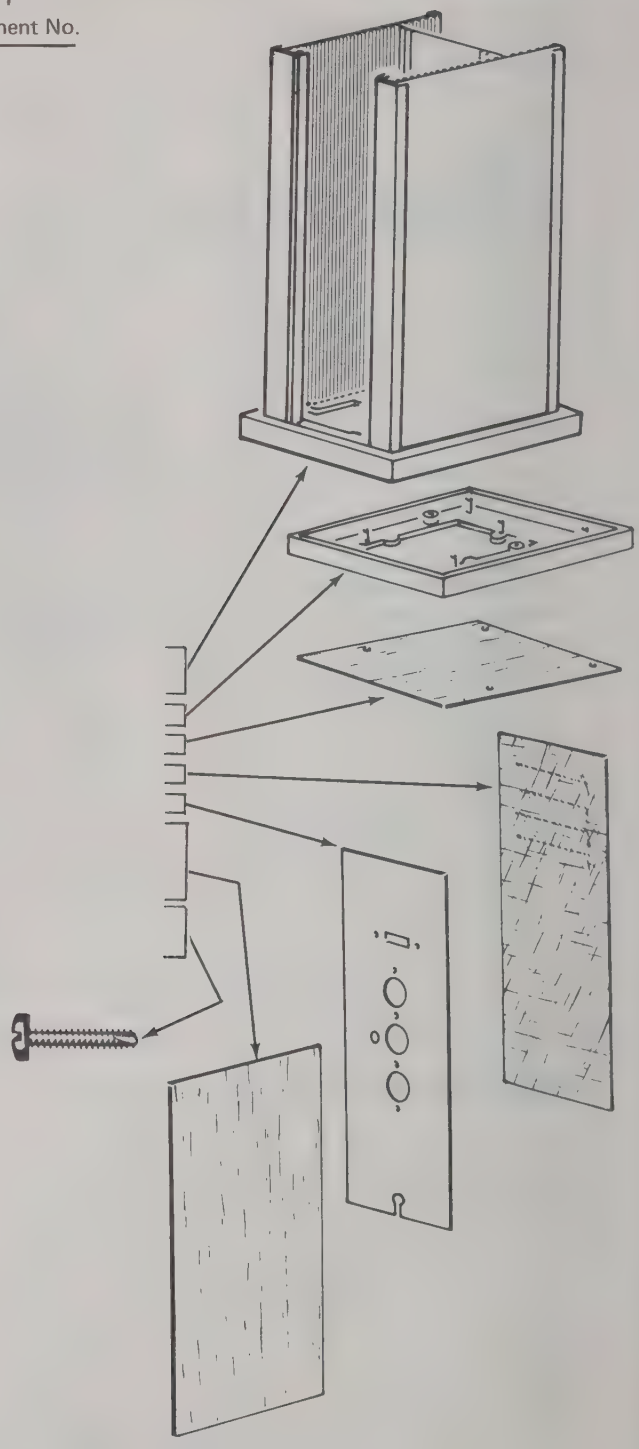


QTY.	DESCRIPTION	PART No.	CIRCUIT Component No.

CABINET

Cabinet assembly consisting of:

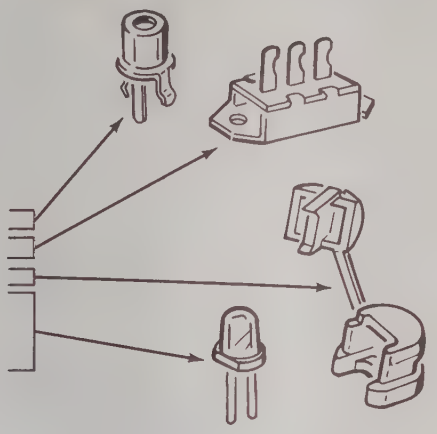
( )	1	Extrusion with end panel attached	230-1531
( )	1	End panel	230-1532
( )	2	End cover	230-1533
( )	1	Front panel	230-1534
( )	1	Rear panel	230-1535
( )	2	Side cover (may be attached to cabinet assembly)	230-1536
( )	8	#6 x 5/8" black self-tapping screw	230-1520



QTY.	DESCRIPTION	PART No.	CIRCUIT Component No.

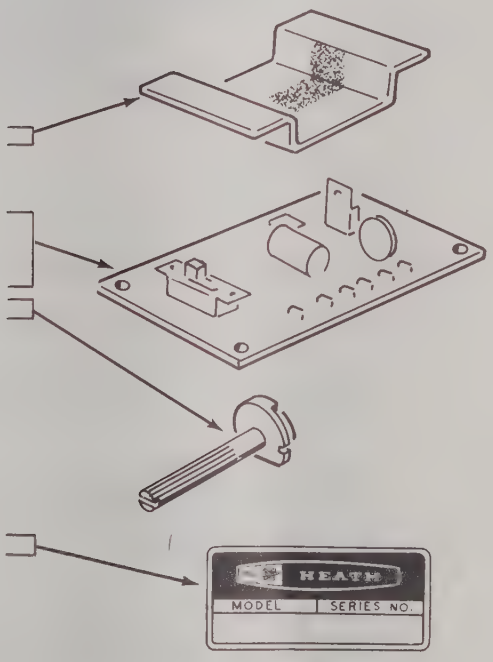
GENERAL

( )	3	Phono socket	230-1528	
( )	1	3-lug slide switch	60-4	SW501
( )	1	Strain relief	75-71	
( )	1	FLV-117 LED (light emitting diode)	230-1527	LED



MISCELLANEOUS

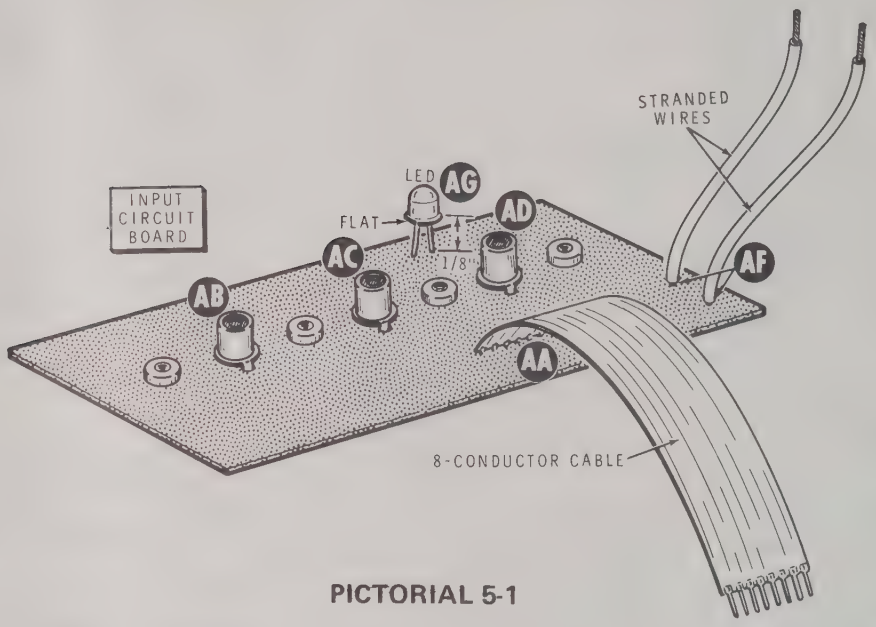
( )	1	Battery bracket	230-1521
( )	1	Input circuit board (1163)	230-1519
( )	1	Preassembled test circuit board (B-1366) with test leads.	230-1501
( )	1	Alignment tool	490-178
( )	1	Label sheet	390-1045
( )	1	Security label	390-1306



NOTE: Be sure you refer to the numbers on the blue and white label in any communications you have about this kit with Heath Company. You may want to write the model and series numbers in this sample for a future convenience.

( )	1	Blue and white label	391-34
( )	2	9-volt battery (#216, NEDA 1604)	
( )	1	Phono plug	438-46

STEP-BY-STEP ASSEMBLY



PICTORIAL 5-1

INPUT CIRCUIT BOARD ASSEMBLY.

Refer to Pictorial 5-1 for the following steps.

( ) Locate the input circuit board (#1163) and position it as shown.

( ) Insert the pins at one end of the 8-conductor cable through the eight circuit board holes at AA and solder the pins to the foil. Be careful not to bend the pins on the other end of this cable.

( ) Refer to Detail 5-1A and install a phono socket on the circuit board at AB. Note that the phono socket has three lugs. Note also, on the foil side of the circuit board, that there are three foils for the socket lugs. Position the socket so the center lug can be bent over onto the foil. Then solder all three lugs.

( ) In the same manner, install the other two phono input sockets at AC and AD on the circuit board.

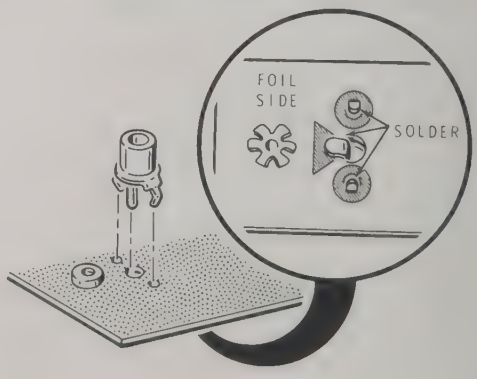
( ) Locate two blue stranded wires. Twist the fine wire strands at the ends of both wires. Then apply a small amount of solder to the bare ends of these wires to hold the strands in place.

( ) Solder one end of each wire to the circuit board at AF.

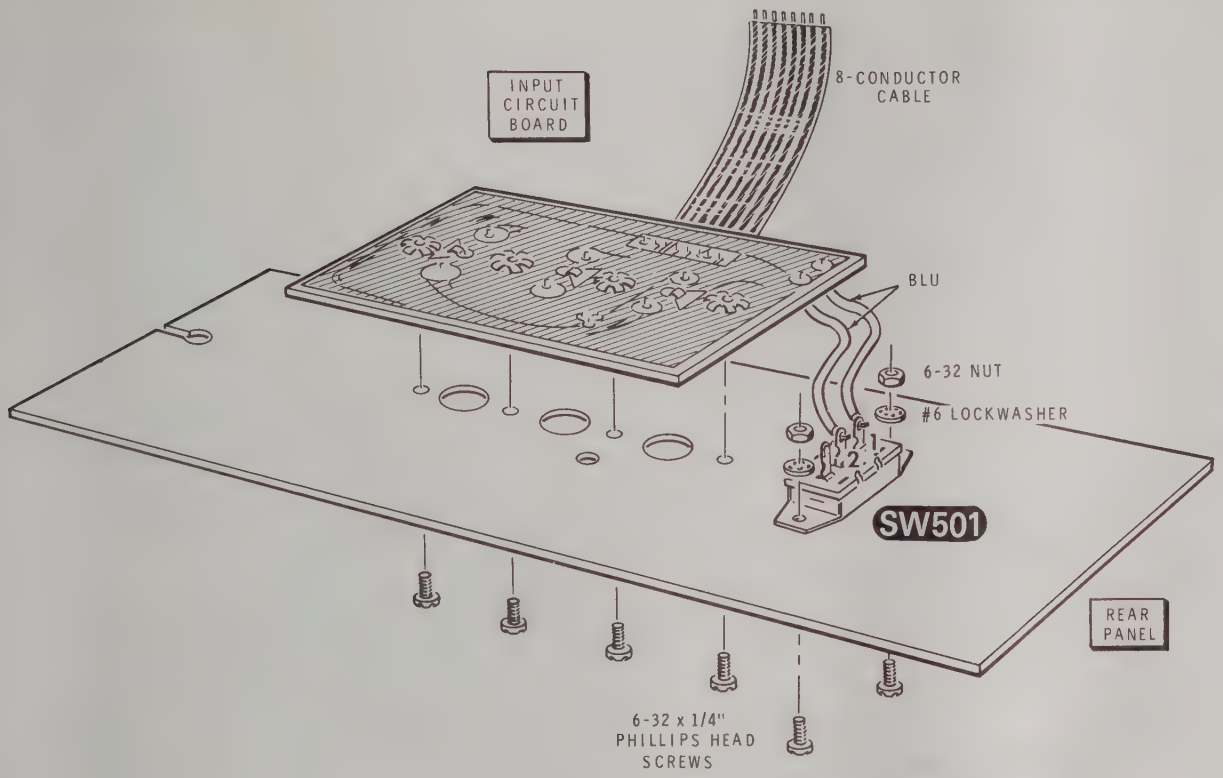
( ) Insert the LED (light emitting diode) leads through the circuit board at AG. Be sure to install the LED so the flat is positioned as shown. Position the LED not more than 1/8" off the circuit board and solder the leads to the foil.

( ) Cut any excess lead lengths from the foil side of the circuit board.

( ) Temporarily lay the input circuit board aside and locate the rear panel.



Detail 5-1A



PICTORIAL 5-2

Refer to Pictorial 5-2 for the following steps.

( ) Mount the 3-lug slide switch to the rear panel at SW501 with two 6-32 x 1/4" phillips screws, two #6 lockwashers, and two 6-32 nuts. Be sure to position the switch lugs as shown.

( ) Mount the input circuit board to the rear panel with four 6-32 x 1/4" phillips screws. It will be necessary to bend the 8-conductor cable to allow the circuit board to lay against the rear panel.

( ) Solder either blue wire coming from the circuit board to lug 1 of switch SW501.

( ) Solder the other blue wire coming from the circuit board to lug 2 of switch SW501.

This completes the wiring of your Central Processor. Proceed to "Alignment."

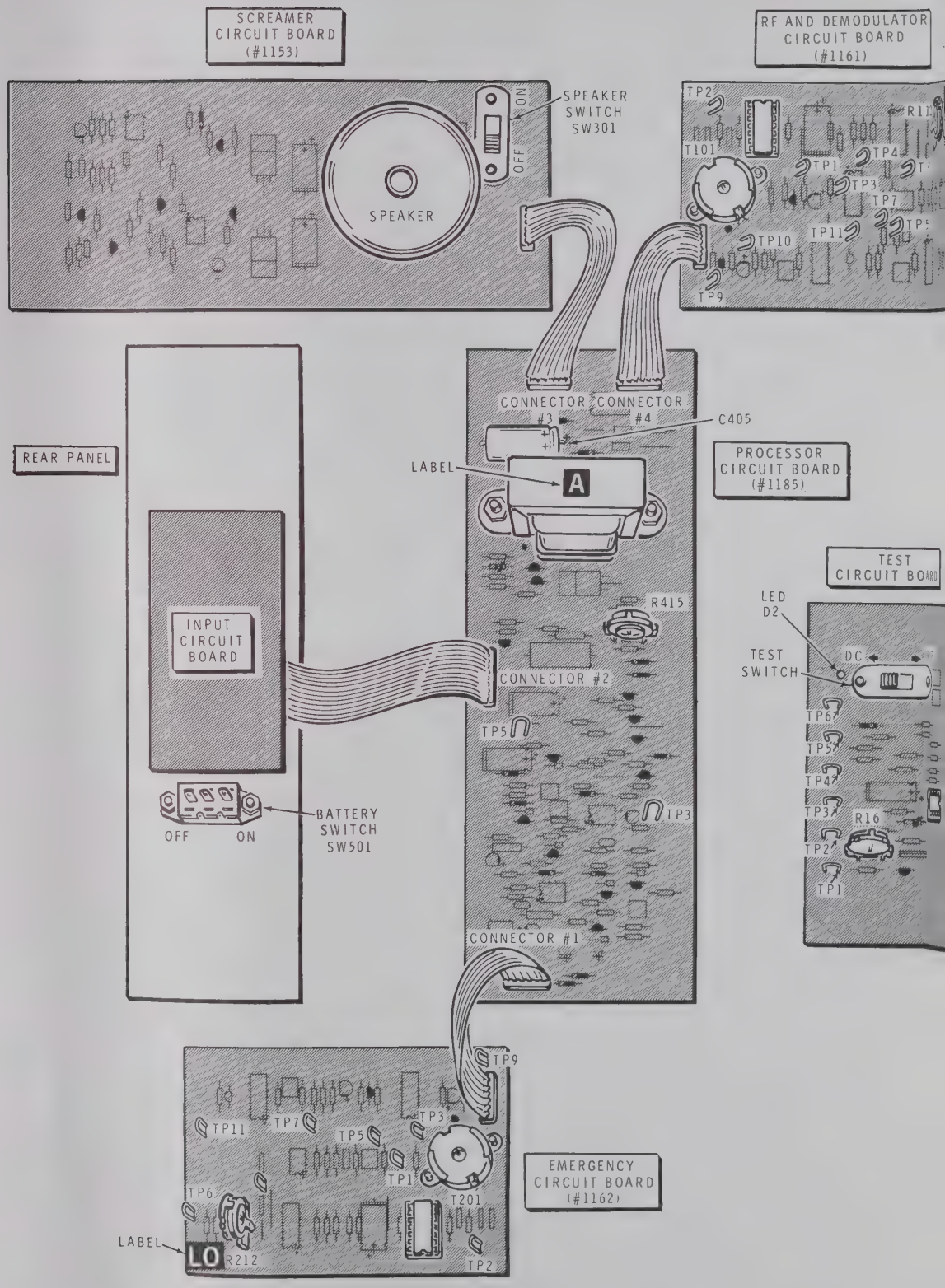
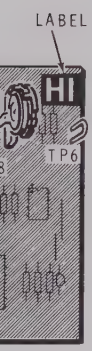

SCREAMER CIRCUIT BOARD (#1153)
RF AND DEMODULATOR CIRCUIT BOARD (#1161)
SPEAKER SWITCH SW301
ON
OFF
SPEAKER
TP2
T101
TP1
TP4
TP3
TP7
TP10
TP11
TP9
REAR PANEL
CONNECTOR #3
CONNECTOR #4
C405
LABEL
A
PROCESSOR CIRCUIT BOARD (#1185)
TEST CIRCUIT BOARD
LED D2
TEST SWITCH
DC
INPUT CIRCUIT BOARD
R415
CONNECTOR #2
TP5
TP6
TP4
TP3
R16
TP2
TP1
OFF
ON
BATTERY SWITCH SW501
CONNECTOR #1
TP9
TP11
TP7
TP3
TP5
TP1
TP6
T201
TP2
EMERGENCY CIRCUIT BOARD (#1162)
LABEL
LO
R212

Figure 1-2


LABEL
HI
TP6

RD

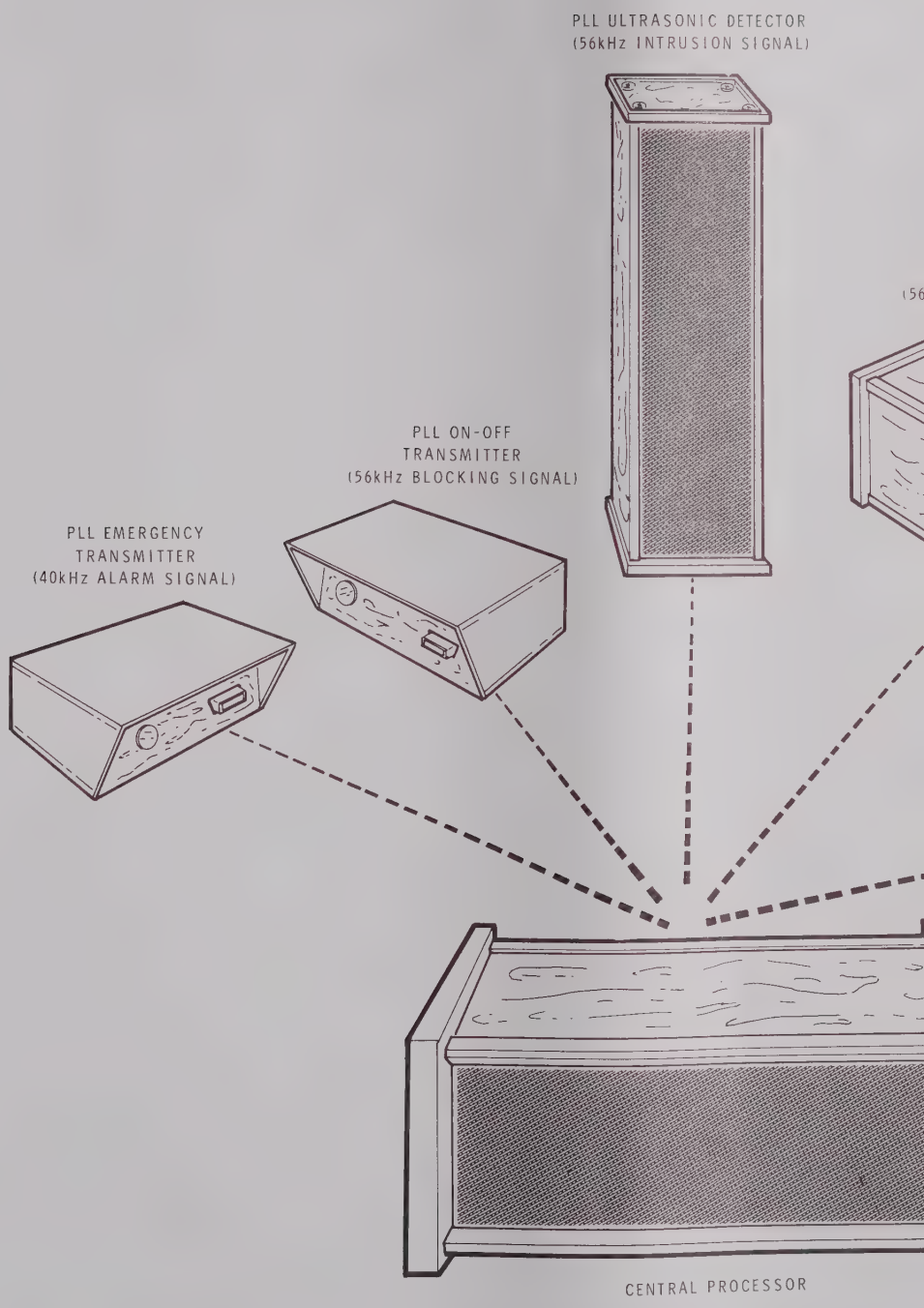
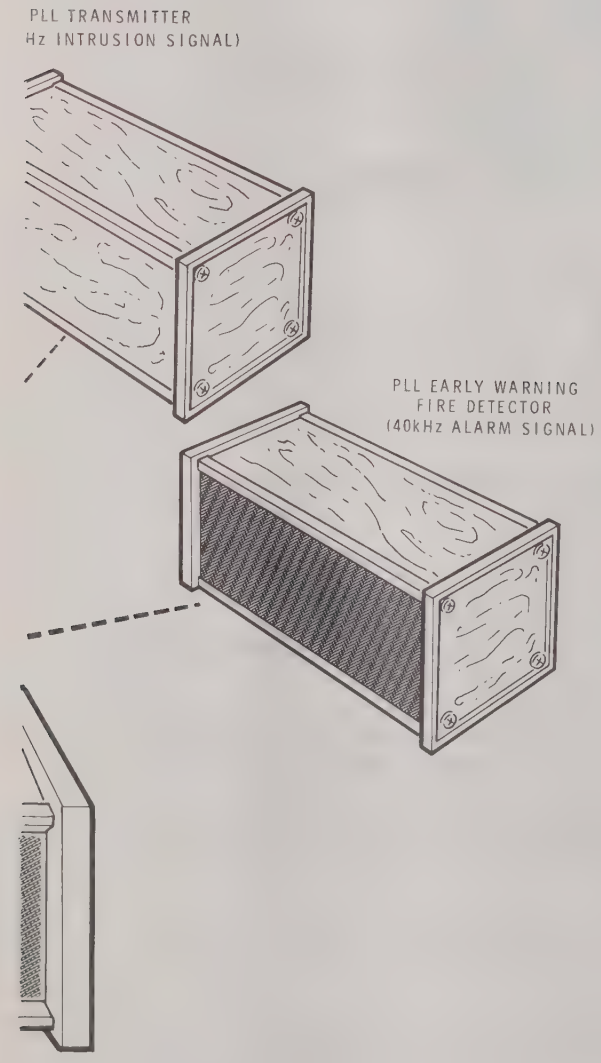

PLL ULTRASONIC DETECTOR
(56kHz INTRUSION SIGNAL)
PLL ON-OFF
TRANSMITTER
(56kHz BLOCKING SIGNAL)
PLL EMERGENCY
TRANSMITTER
(40kHz ALARM SIGNAL)
CENTRAL PROCESSOR

Figure 1-1


PLL TRANSMITTER
Hz INTRUSION SIGNAL)
PLL EARLY WARNING
FIRE DETECTOR
(40kHz ALARM SIGNAL)

ALIGNMENT

INTRODUCTION

In the following alignment procedure you will align your Central Processor and any Transmitters that you have purchased; such as the PLL Emergency Transmitter, the PLL Transmitter, the PLL On-Off Transmitter, and the PLL Ultrasonic Detector.

Refer to Figure 1-1 (fold-out from Page 50) while you read this "Introduction."

The Transmitters act much like a radio station that transmits signals to your home FM receiver. However, in this case instead of music or news, they are transmitting "alarm," "intrusion," or "blocking" signals. These signals are transmitted through your house wiring instead of through the air, so you don't need an antenna.

The Emergency Transmitter and the Fire Detector transmit a 40 kHz signal that we shall call an "alarm" signal. This signal would indicate that immediate help is needed. The PLL Transmitter and the Ultrasonic Detector Transmitter transmits a 56 kHz signal that we shall call an "intrusion" signal. This signal would indicate that someone has entered a building or area that is protected by this Transmitter. The On-Off Transmitter also transmits a 56 kHz signal, except it is changed slightly to do a different job. This signal we shall call a "blocking" signal. A blocking signal will block an intrusion signal but it will not block an alarm signal.

The Central Processor acts much like your FM receiver. In fact it acts like two FM receivers, each tuned to a different station. One receiver receives the "alarm" (40 kHz) signals, and the other receiver receives the "intrusion" and "blocking" (56 kHz) signals. The Central Processor then translates these signals into an action. This action may be to sound an audible alarm, to block an intrusion signal, or to actuate some external device.

The following section is called "Central Processor Alignment." In this section you will align the Central Processor to one "alarm" (40 kHz) transmitter, and one "intrusion" or one "blocking" (56 kHz) transmitter.

The "Central Processor Alignment" section (refer to Page 52) is divided into three parts. In the first part ("Processor Circuit Board Adjustment"), you will connect the test circuit board to the Central Processor and make certain initial adjustments on the processor circuit board.

In the second part ("40 kHz Alignment" on Page 55), you will align the 40 kHz receiver in the Central Processor to one "alarm" (emergency or fire detector) transmitter. NOTE: If you did not purchase an Emergency Transmitter or a Fire Detector, you may disregard this part and go directly to the third part.

In the third part ("56 kHz Alignment" on Page 57), you will align the 56 kHz receiver in the Central Processor to one "intrusion" or one "blocking" transmitter. This is either a PLL Transmitter, a PLL Ultrasonic Detector, or a PLL On-Off Transmitter.

At the completion of these three parts, you will have aligned the Central Processor to receive 40 kHz "alarm" signals and 56 kHz "intrusion" or "blocking" signals. However, at this point none of the transmitters are properly aligned to transmit these signals to the Central Processor. (This includes the two Transmitters that were used to align the Central Processor in parts one and two.)

In the "Transmitter Alignment Section" (refer to Page 60), each transmitter will be aligned to transmit the correct 40 kHz or 56 kHz signal.

CENTRAL PROCESSOR ALIGNMENT

Refer to Figure 1-2 (fold-out from Page 50) for the following steps.

( ) Locate the sheet of stick-on labels. In each of the following steps, cut the indicated label from the sheet and stick the label onto the component side of the specified circuit board. If you do not have a particular circuit board (for example, the emergency transmitter circuit board) disregard that step and continue with the circuit boards that you do have.

Place stick-on letters on the circuit boards of the Central Processor as follows:

( ) Cut the letters "LO" from the label sheet and press them on the emergency circuit board (#1162). NOTE: This is not the emergency transmitter circuit board.

( ) Cut the letters "HI" from the label sheet and press them onto the RF and demodulator circuit board (#1161).

( ) Cut the letter "A" from the label sheet and press it onto the processor circuit board (#1185).

Refer to the fold-out from Page 81 for the following steps.

( ) Cut the letter "B" from the label sheet and press it onto the PLL emergency transmitter circuit board (#1140, black dot on the coil). Put the label on capacitor C106.

( ) Cut the letter "C" from the label sheet and press it onto the PLL on-off transmitter circuit board (#1140, gold dot on the coil). Put the label on capacitor C106.

( ) Cut the letter "D" from the label sheet and press it onto the PLL transmitter circuit board (#1221). Put the label on capacitor C106.

Place the next two stick-on letters on the circuit boards of the PLL Ultrasonic Detector as follows:

( ) Cut the letter "E" from the label sheet and press it onto the component side of the PLL circuit board (#1365).

( ) Cut the letter "F" from the label sheet and press it onto the component side of the ultrasonic circuit board (#1364).

( ) Cut the letter "G" from the label sheet and press it onto the fire detector's transmitter circuit board (#1673).

In the following alignment procedure, the central processor and transmitter circuit boards will be called out by the letters that have been affixed to them.

PROCESSOR CIRCUIT BOARD ADJUSTMENT

NOTE: The preassembled test circuit board is prealigned at the factory. DO NOT move the control on the test circuit board. After you have finished the alignment of your system, you should store the test circuit board, Manual, test leads, and alignment tool in a safe place for possible future use.

Refer to Figure 1-2 for the following steps.

( ) Place the five central processor circuit boards and the test circuit board on your work surface as shown.

NOTE: Make sure that your circuit boards are not setting on a metal surface. This could cause a short circuit and damage the board as well as cause a shock hazard. Also make sure that there are no wire clippings or solder splashes on your work surface that could short the circuit board foils together.

( ) Connect the 8-conductor cable coming from the input circuit board to connector #2 on circuit board "A." (This is the circuit board with the letter "A" affixed to it.) Position the rear panel with its printed side down.

( ) Connect the screamer circuit board (the circuit board with the speaker on it) to connector #3 on circuit board "A" with a 6-conductor cable.

( ) Connect circuit board "HI" to connector #4 on the circuit board "A" with a 6-conductor cable.

( ) Connect circuit board "LO" to connector #1 on circuit board "A" with a 6-conductor cable.

( ) Set the SPEAKER switch on the screamer circuit board to OFF.

( ) Make sure that the BATTERY switch on the rear panel is in the OFF position.

Locate the test leads and connect them between the test circuit board and circuit board "A" as follows.

( ) Connect a test lead from TP1 on the test circuit board to TP3 on circuit board "A."

( ) Connect a test lead from TP2 on the test circuit board to TP5 on circuit board "A."

( ) Connect a test lead from TP3 on the test circuit board to TP5 on the test circuit board. NOTE: Both of these test points are on the test circuit board.

( ) Connect a test lead from TP4 on the test circuit board to the plus (+) lead of capacitor C405 on circuit board "A."

( ) Set the TEST switch on the test circuit board to DC.

( ) Set control R415 on circuit board "A" fully clockwise (as viewed from the rotating side of the control).

CAUTION: When the line cord of any unit is connected to an AC outlet, dangerous 120-volt AC current will be present on that circuit board. See the fold-out from Page 81.

( ) Connect the central processor line cord to an AC outlet. (This is the line cord coming from circuit board "A.")

NOTE: If you do not obtain the indicated results in the following steps, remove the line cord from the AC outlet and refer to the "Possible Cause of Trouble" chart at the end of this section.

( ) Turn control R415 on circuit board "A" counterclockwise only as far as needed so that LED D2 is brightly lit.

( ) Disconnect the line cord (coming from circuit board "A") from the AC outlet.

( ) Disconnect all of the test leads that are connected between the test circuit board and circuit board "A," and the test lead that is connected between TP3 and TP5 on the test circuit board.

This completes the processor circuit board adjustment. Leave the circuit boards connected together.

POSSIBLE CAUSE OF TROUBLE

TROUBLE	POSSIBLE CAUSE
LED will not light.	1. Unit is not connected to live AC outlet. Use AC outlet that you know is working. 2. Test leads are not connected to correct TP's on test circuit board and circuit board "A." 3. Fuse wire on circuit board "A" is open. 4. No DC voltage on circuit board "A." Check this as follows: A. Disconnect test lead from TP3 on test circuit board (leave other end connected). Use this end of test lead as test probe. B. Connect line cord from circuit board "A" to AC outlet. C. Touch test lead coming from TP5 to TP4 on test circuit board. LED should light. If Led does not light, proceed to Trouble "No unregulated voltage." If LED did light, proceed to step D. D. Touch test lead to TP2 on test circuit board. LED should light. If LED does not light, proceed to Trouble "No regulated voltage."
No unregulated voltage.	1. Diodes D405, D406, D408, or D409 incorrectly installed or shorted. 2. Transformer T401 open.
No regulated voltage.	1. Diode D410 incorrectly installed or shorted. 2. Transistors Q404, Q406, or Q407 incorrectly installed or shorted.
LED stays lit.	1. Control R415 is turned full clockwise. 2. Test leads are not connected to correct TP's on test circuit board and on circuit board "A." 3. Diode D410 incorrectly installed or shorted. 4. Transistors Q404, Q406, or Q407 incorrectly installed or shorted.

40 kHz ALIGNMENT

In the following steps, you will align the 40 kHz receiver in the Central Processor. This will require the use of a 40 kHz transmitter, preferably a PLL Emergency Transmitter. If you do not have an Emergency Transmitter but do have a PLL Early Warning Fire Detector, use it for this alignment procedure. Use the appropriate "PLL Emergency Transmitter" or "PLL Early Warning Fire Detector" steps below. If you do not have either of these units, disregard the rest of the information under "40 kHz Alignment" and proceed to the "56 kHz Alignment."

PLL Emergency Transmitter

Refer to Figure 1-3 (fold-out from Page 81) for the following steps.

Perform the following steps on the PLL Emergency Transmitter (circuit board "B").

( ) Set control R124 to its center of rotation.

( ) Connect the line cord coming from circuit board "B" to an AC outlet.

NOTE: If you do not get the indicated results from your Transmitter in the following steps, refer to the "In Case of Difficulty" section in the Emergency Transmitter's Manual. If you do not know if it is the transmitter circuit board or the central processor circuit board that is not working, refer first to the "Possible Cause of Trouble," section that follows each alignment section.

( ) Push switch SW101 in. The neon lamp should light.

Now proceed directly to "40 kHz Alignment Continued." Disregard the steps under "PLL Early Warning Fire Detector."

PLL Early Warning Fire Detector

Refer to Figure 1-4 (fold-out from Page 81) for the following steps.

Perform the following steps on circuit board "G" of the Fire Detector. Do not connect the two fire detector circuit boards together for the following steps.

( ) Set control R117 on circuit board "G" to its center of rotation.

( ) Refer to Figure 1-4 and connect a test lead to the indicated leads of capacitors C103 and C104.

( ) Connect the line cord coming from circuit board "G" to an AC outlet.

Now proceed directly to "40 kHz Alignment Continued."

40 kHz Alignment Continued

Make the following connections and adjustments on circuit board "A" and "LO."

( ) Connect a test lead from TP1 on the test circuit board to TP3 on circuit board "A."

( ) Connect a test lead from TP4 on the test circuit board to the plus (+) lead of capacitor C405 on circuit board "A."

( ) Connect a test lead from TP6 on the test circuit board to TP2 on circuit board "LO."

( ) Set the TEST switch on the test circuit board to RF.

( ) Connect the line cord coming from circuit board "A" to an AC outlet.

NOTE: In many of the following steps you will be told to slowly turn a particular slug in a coil while you watch for some reaction in LED D2. The exact point that you are looking for is very small and can be easily passed without your realizing it. Also, there may exist a small time delay between the time that you reach the correct adjustment and the time that the LED reacts. For example: Let's say that you are turning a coil slug and you are watching for the LED to go out. As you turn the slug you reach the correct adjustment, but because of the time delay, the LED is still lit; so you continue to turn the slug. Now you have passed the correct point and the LED will remain lit. Therefore, whenever you are told to slowly turn an adjustment, turn the control or slug not faster than one complete turn in half a minute. Also turn the control or slug in small steps, waiting about one second between each step to allow for the time delay. If you are unable to locate the correct point, repeat the adjustment several times to make sure you have not passed it.

( ) Use the plastic alignment tool to slowly turn the slug in coil T201 on circuit board "LO," in either direction (not more than one turn), until LED D2 stops flickering. At this point the LED will be dimly lit or out. (The point where is stops flickering is right in the center of a tuning range.) To make sure you have the correct point, very slightly turn the slug in each direction and note that the LED begins to flicker brightly.

( ) Remove the test lead that is connected between TP2 on circuit board "LO" and TP6 on the test circuit board.

( ) Connect a test lead from TP5 on the test circuit board to TP5 on circuit board "LO."

( ) Set the TEST switch on the test circuit board to DC.

( ) Turn control R212 on circuit board"LO" to its full clockwise position (as viewed from the rotating side of the control).

( ) Now slowly turn control R212 counterclockwise and watch LED D2. First, the LED will flicker. Then as you continue to turn the control, the flickering will stop and the LED will glow steadily. This is the correct adjustment.

( ) Disconnect the line cord coming from circuit board "A" from the AC outlet.

( ) Disconnect the line cord coming from circuit board "B" or "G" from the AC outlet.

( ) Disconnect all the test leads that are connected between the test circuit board and circuit board "A" and from between the test circuit board and circuit board "LO."

( ) This completes the "40 kHz Alignment," proceed to "56 kHz Alignment."

POSSIBLE CAUSE OF TROUBLE

NOTE: If a possible cause in this chart refers to a circuit board other than the one you used in the alignment procedure, disregard the possible cause. If you do not know if the trouble is in the Transmitter or the Central Processor, try another transmitter if one is available.

TROUBLE	POSSIBLE CAUSE
LED D2 will not light when test lead is connected from TP6 on test circuit board to TP2 on circuit board "LO."	1. Test leads not connected to correct TP's on test circuit board or on circuit boards "A" and "LO." 2. TEST switch on test circuit board is in wrong position. 3. Line cords from circuit boards "A" and "B" or "G" not connected to AC outlet. Make sure neon lamp on circuit board "B" is lit. 4. Wrong transmitter circuit board. Check color dot on coil on circuit board "B" or "G." It should be black dot. Color dot on the coil on circuit board "LO" should also be black dot. 5. IC A201 on circuit board "LO" is shorted. Check this by interchanging IC with IC A203.
LED D2 stays lit (will not flicker) when test lead is connected from TP6 on test circuit board to TP2 on circuit board "LO."	1. Control R124 on circuit board "B" or control R117 on circuit board "G" (whichever was used) set too far clockwise (as viewed from rotating part of control). Turn control counterclockwise and see if LED flickers.

TROUBLE	POSSIBLE CAUSE
LED D2 will not go out during turning of slug with bright flickering on either side.	1. See section on "Shifting Operating Frequency within Tuning Range" on Page 65.
LED D2 will not flicker (stays lit or stays out) when test lead is connected from TP5 on test circuit board to TP5 on circuit board "LO."	1. Test leads not connected to TP's on test circuit board or on circuit board "A." 2. TEST switch on test circuit board is in wrong position. 3. Line cords from circuit boards "A" or "B" or "G" not connected to AC outlet. Make sure neon lamp on circuit board "B" is lit. 4. IC A202 on circuit board "LO" shorted. Check this by interchanging IC with IC A102 from circuit board "HI." 5. IC A203 on circuit board "LO" shorted. Check this by interchanging IC with IC A103 from circuit board "HI."

56 kHz ALIGNMENT

In the following alignment procedure, you will align the 56 kHz receiver in the Central Processor. This will require the use of a 56 kHz transmitter, preferably a PLL On-Off Transmitter. If you have a PLL On-Off Transmitter, proceed with the steps under the heading "PLL On-Off Transmitter." If you do not have this Transmitter, proceed with the steps under the heading "PLL Transmitter." If you do not have the PLL Transmitter, proceed with the steps under the heading "PLL Ultrasonic Detector."

PLL On-Off Transmitter

Refer to Figure 1-5 (fold-out from Page 81) for the following steps.

Perform the following steps on the PLL On-Off Transmitter (circuit board "C").

( ) Set control R124 to its center of rotation.

( ) Connect the line cord coming from circuit board "C" to an AC outlet.

NOTE: If you do not get the indicated results from your Transmitter in the following steps, refer to the "In Case of Difficulty" section in the On-Off Transmitter Manual. If you do not know if it is the transmitter or the Central Processor that is not working, refer first to the "Possible Cause of Trouble" section that follows each alignment section.

( ) Push switch SW101 in. The neon lamp should light.

Now proceed directly to the steps under "56 kHz Alignment Continued." Disregard the steps under "PLL Transmitter" and "PLL Ultrasonic Detector."

PLL Transmitter

Refer to Figure 1-6 (fold-out from Page 81) for the following steps.

Perform the following steps on the PLL Transmitter (circuit board "D").

( ) Set control R119 to its center of rotation.

( ) Push switch SW101 in.

( ) Refer to the Figure and connect a test lead to the indicated leads of R123 and R129.

( ) Connect the line cord coming from circuit board "D" to an AC outlet.

Now proceed directly to the steps under "56 kHz Alignment Continued." Disregard the steps under "PLL Transmitter" and "PLL Ultrasonic Detector."

PLL Ultrasonic Detector

Refer to Figure 1-7 (fold-out from Page 81) for the following steps.

Perform the following steps on the PLL Ultrasonic Transmitter (circuit board "E").

NOTE: There are two circuit boards in the Ultrasonic Transmitter, circuit board "E" and circuit board "F." Make sure that these boards are not connected together for the following tests.

( ) Set control R241 to its center of rotation.

( ) Refer to Figure 1-7 and connect a test lead between TP22 and TP7 on circuit board "E." Be sure that the test lead clip does not touch transistor Q201.

( ) Connect the line cord coming from circuit board "E" to an AC outlet.

Now proceed directly to the steps under "56 kHz Alignment Continued."

56 kHz Alignment Continued

( ) Connect a test lead from TP1 on the test circuit board to TP3 on circuit board "A."

( ) Connect a test lead from TP4 on the test circuit board to the plus (+) lead of capacitor C405 on circuit board "A."

( ) Connect a test lead from TP6 on the test circuit board to TP2 on circuit board "HI."

( ) Connect the line cord coming from circuit board "A" to an AC outlet.

( ) Set the TEST switch on the test circuit board to RF.

NOTE: If you do not obtain the indicated results in the following steps, remove the line cord from the AC outlet and refer to the "Possible Cause of Trouble" chart at the end of this section.

NOTE: In many of the following steps you will be told to slowly turn a particular slug in a coil while you watch for some reaction in LED D2. The exact point that you are looking for is very small and can be easily passed without your realizing it. Also, there may exist a small time delay between the time that you reach the correct adjustment and the time that the LED reacts. For example: Let's say that you are turning a coil slug and you are watching for the LED to go out. As you turn the slug, you reach the correct adjustment. But because of the time delay, the LED is still lit, so you continue to turn the slug. Now you have passed the correct point and the LED remains lit. Therefore, whenever you are told to slowly turn an adjustment, turn the control or slug not faster than one complete turn in half a minute. Also turn the control or slug in small steps, waiting about one second between each step to allow for the time delay. If you are unable to locate the correct point, repeat the adjustment several times to make sure you have not passed it.

( ) Use the plastic alignment tool to slowly turn the slug in coil T101 or circuit board "HI" in either direction (not more than one turn) until LED D2 stops flickering. At this point the LED will be dimly lit or out. (The point where it stops flickering is right in the center of the tuning range.) To make sure you have the correct point, very slightly turn the slug in both directions and note that the LED begins to flicker brightly.

( ) Remove the test lead that is connected between TP2 on circuit board "HI" and TP6 on the test circuit board.

( ) Connect a test lead from TP5 on the test circuit board to TP5 on circuit board "HI."

( ) Set the TEST switch on the test circuit board to DC.

( ) Turn control R112 on circuit board "HI" to its full clockwise position (as viewed from the rotating side of the control).

( ) Now slowly turn control R112 counterclockwise and watch LED D2. First the LED will flicker. As you continue to turn the control, the flickering will stop and the LED will glow steadily. This is the correct adjustment.

( ) Disconnect the line cord (coming from circuit board "A") from the AC outlet.

( ) Disconnect the line cord of the Transmitter (either circuit board "C," "D," or "E;" whichever was used) from the AC outlet.

( ) Disconnect all the test leads that are connected between the test circuit board and circuit board "A," and those connected between the test circuit board and circuit board "HI."

This completes the "56 kHz Alignment." Proceed to "Transmitter Alignment."

POSSIBLE CAUSE OF TROUBLE

NOTE: If a possible cause in this chart refers to a circuit board other than the one you used in the alignment procedure, disregard the possible cause. If you do not know if the trouble is in the Transmitter or the Central Processor, try another transmitter if one is available.

TROUBLE	POSSIBLE CAUSE
LED D2 will not light when test lead is connected from TP6 on test circuit board to TP2 on circuit board "HI."	1. Test leads not connected to correct TP's on test circuit board or circuit boards "A" or "HI." 2. Jumper lead on circuit board "D" or "E" (if you used either of these boards) not connected to the correct places. 3. TEST switch on test circuit board is in wrong position. 4. Line cords from circuit boards "A" and "C," "D," or "E" not connected to AC outlet. 5. Wrong transmitter circuit board. Check color dot on coil on circuit board "C," "D," or "E." Also check color dot on coil on circuit board "HI." Color dots should be gold. 6. IC A101 on circuit board "HI" shorted. Check this by interchanging IC with IC A201.
LED D2 stays lit (won't flicker) when test lead is connected from TP6 on test circuit board to TP2 on circuit board "HI."	1. Control R124 (on circuit board "C"), control R119 (on circuit board "D"), or control R241 (on circuit board "E") is set too far clockwise. Turn control counterclockwise and see if LED flickers.
LED D2 will not go out during turning of slug with bright flickering on either side.	1. See section on "Shifting Operating Frequency within Tuning Range" on Page 65.
LED D2 will not flicker (stays lit or stays out) when test lead is connected from TP5 on test circuit board to TP5 on circuit board "HI."	1. Test leads not connected to correct TP's on test circuit board or circuit boards "A" or "HI." 2. Jumper lead on circuit board "D" or "E" (if you used either of these boards) not connected to correct places. 3. Test switch on test circuit board in wrong position. 4. IC A102 on circuit board "HI" shorted. Check this by interchanging IC with IC A202 from circuit board "LO." 5. IC A103 on circuit board "HI" shorted. Check by interchanging IC with IC A203 from circuit board "LO."

TRANSMITTER ALIGNMENT

Perform the following alignment procedure for each transmitter that you have. Disregard the instructions for any transmitter that you do not have. If you fail to get the indicated results in any of the following steps, refer to the "Possible Cause of Trouble" chart at the end of each section.

56 kHz TRANSMITTER ALIGNMENT

PLL-On-Off Transmitter

Refer to Figure 1-5 and Figure 3-1 (fold-out from Page 81) for the following steps.

( ) Set control R124 on circuit board "C" to its center of rotation.

( ) Connect a test lead from TP1 on the test circuit board to TP3 on circuit board "A."

( ) Connect a test lead from TP4 on the test circuit board to the plus (+) lead of capacitor C405 on circuit board "A."

( ) Connect a test lead from TP6 on the test circuit board to TP2 on circuit board "HI."

( ) Set the TEST switch on the test circuit board to RF.

( ) Connect the line cord coming from circuit board "A" to an AC outlet.

( ) Connect the line cord coming from circuit board "C" to an AC outlet.

( ) Push switch SW101 on circuit board "C" in.

( ) Use the plastic alignment tool to slowly turn the slug in coil L101 on circuit board "C" in either direction (not more than one turn) until LED D2 stops flickering. At this point the LED will be dimly lit or out. (The point where it stops flickering is right in the center of the tuning range.) To make sure you have the correct point, very slightly turn the slug in both directions and note that the LED begins to flicker brightly.

( ) Disconnect the test lead from between TP2 on circuit board "HI" and TP6 on the test circuit board.

( ) Connect a test lead from TP5 on the test circuit board to TP10 on circuit board "HI."

( ) Set the TEST switch on the test circuit board to DC.

( ) Turn control R124 on circuit board "C" fully counterclockwise.

( ) Now turn control R124 very slowly clockwise until LED D2 goes out. Mark this position.

( ) Continue to turn control R124 clockwise until LED D2 lights again. Mark this position.

( ) Set control R124 midway between these two marked positions.

( ) Disconnect the line cord (coming from circuit board "C") from the AC outlet.

( ) Disconnect the line cord (coming from circuit board "A") from the AC outlet.

( ) Disconnect all of the test leads from between the test circuit board and circuit board "A," and from between the test circuit board and circuit board "HI."

PLL Transmitter

Refer to Figure 1-6 and Figure 3-1 (fold-out from Page 81) for the following steps.

( ) Set control R119 on circuit board "D" to its center of rotation.

( ) Refer to Figure 1-6 and connect a test lead to the indicated leads of resistor R123 and R129 on circuit board "D."

( ) Connect a test lead from TP1 on the test circuit board to TP3 on circuit board "A."

( ) Connect a test lead from TP4 on the test circuit board to the plus (+) lead of capacitor C405 on circuit board "A."

( ) Connect a test lead from TP6 on the test circuit board to TP2 on circuit board "HI."

( ) Set the TEST switch on the test circuit board to RF.

( ) Push in switch SW101 on circuit board "D."

( ) Connect the line cord coming from circuit board "A" to an AC outlet.

( ) Connect the line cord coming from circuit board "D" to an AC outlet.

( ) Use the plastic alignment tool to slowly turn the slug in coil L101 on circuit board "D" in either direction (not more than one turn) until LED D2 stops flickering. At this point the LED will be dimly lit or out. (The point where it stops flickering is right in the center of the tuning range.) To make sure you have the correct point, very slightly turn the slug in both directions and note that the LED begins to flicker brightly.

( ) Disconnect the test lead from between TP2 on circuit board "HI" and TP6 on the test circuit board.

( ) Connect a test lead from TP5 on the test circuit board to TP9 on circuit board "HI."

( ) Set the TEST switch on the test circuit board to DC.

( ) Turn control R119 on circuit board "D" full counterclockwise.

( ) Now turn control R119 very slowly clockwise until LED D2 lights. Mark this position.

( ) Continue to turn control R119 clockwise until LED D2 goes out. Mark this position.

( ) Set control R119 midway between these two marked positions.

( ) Disconnect the line cord (coming from circuit board "A") from the AC outlet.

( ) Disconnect the line cord (coming from circuit board "D") from the AC outlet.

( ) Disconnect all the test leads from between the test circuit board and circuit board "A," and from between the test circuit board and circuit board "HI."

( ) Disconnect the test lead that is connected between the leads of resistors R123 and R129 on circuit board "D."

PLL Ultrasonic Detector

Refer to Figure 1-7 and Figure 3-1 (fold-out from Page 81) for the following steps.

NOTE: You will make the following adjustments only on circuit board "E." Do not connect circuit boards "E" and "F" together.

( ) Set control R241 to its center of rotation.

( ) Connect a test lead from TP1 on the test circuit board to TP3 on circuit board "A."

( ) Connect a test lead from TP4 on the test circuit board to the plus (+) lead of capacitor C405 on circuit board "A."

( ) Connect a test lead from TP6 on the test circuit board to TP2 on circuit board "HI."

( ) Connect a test lead between TP22 and TP7 on circuit board "E." Be sure that the test lead clip does not touch transistor Q201.

( ) Set the TEST switch on the test circuit board to RF.

( ) Connect the line cord coming from circuit board "A" to an AC outlet.

( ) Connect the line cord coming from circuit board "E" to an AC outlet.

( ) Use the plastic alignment tool to slowly turn the slug in coil L203 on circuit board "E" in either direction (not more than one turn) until LED D2 stops flickering. At this point the LED will be dimly lit or out. (The point where it stops flickering is right in the center of the tuning range.) To make sure you have the correct point, very slightly turn the slug in both directions and note that the LED begins to flicker brightly.

( ) Disconnect the test lead from between TP2 on circuit board "HI" and TP6 on the test circuit board.

( ) Connect a test lead from TP5 on the test circuit board to TP9 on circuit board "HI."

( ) Set the TEST switch on the test circuit board to DC.

( ) Turn control R241 on circuit board "E" full counterclockwise.

( ) Now turn control R241 very slowly clockwise until LED D2 lights. Mark this position.

( ) Continue to turn control R241 clockwise until LED D2 goes out. Mark this position.

( ) Set control R241 midway between these two marked positions.

( ) Disconnect the line cord (coming from circuit board "A") from the AC outlet.

( ) Disconnect the line cord (coming from circuit board "E") from the AC outlet.

( ) Disconnect all of the test leads from between the test circuit board and circuit board "A," and from between the test circuit board and circuit board "HI."

( ) Disconnect the test lead that is connected between TP7 and TP22 on circuit board "E."

POSSIBLE CAUSE OF TROUBLE

TROUBLE	POSSIBLE CAUSE
LED D2 will not light when test lead is connected from TP6 on test circuit board to TP2 on circuit board "HI."	1. Test leads not connected to correct TP's on test circuit board or circuit boards "A" or "HI." 2. Jumper lead on circuit board "D" or "E" (if you used either of these boards) not connected to correct places. 3. Test switch on test circuit board in wrong position. 4. Line cords from circuit boards "A," and "C," "D," or "E;" not connected to an AC outlet. 5. Switch SW101 on circuit board "C" or "D" not pushed in. 6. Wrong transmitter circuit board. Check color dot on coil on circuit board "C," "D." or "E," also check color dot on coil on circuit board "HI." Color dots should be gold. 7. Transmitter circuit faulty. Refer to "In Case of Difficulty" section in Transmitter's Manual.
LED D2 stays lit (won't flicker) when test lead is connected from TP6 on test circuit board to TP2 on circuit board "HI."	1. Control R124 (on circuit board "C"), control R119 (on circuit board "D"), or control R241 (on circuit board "E") set too far clockwise. Turn control counterclockwise and see if LED flickers. 2. Transmitter circuit faulty. Refer to "In Case of Difficulty" section in Transmitter's Manual.
LED D2 will not go out during turning of slug with bright flickering on either side.	1. See section on "Shifting Operating Frequency within Tuning Range" on Page 65.

The following "Trouble" is for circuit boards "D" and "E" only.	
LED D2 will not light when test lead is connected from TP5 on test circuit board to TP9 on circuit board "HI."	1. Test leads not connected to correct TP's on test circuit board or on circuit board "A" or "HI." 2. Test switch on test circuit board in wrong position. 3. IC A104 on circuit board "HI" shorted. Check this by interchanging IC with IC A204 from circuit board "LO." 4. IC A102 on circuit board "HI." shorted. Check this by interchanging IC with A202 from circuit board "LO." 5. IC A105 on circuit board "HI" shorted. Check this by interchanging IC with IC A205 from circuit board "LO." 6. Make sure transistors Q101 and Q102 are correctly installed.
The following "Trouble" is for circuit board "C" only.	
LED D2 will not go out when test lead is connected from TP5 on test circuit board to TP10 on circuit board "HI."	1. Test leads not connected to correct TP's on test circuit board or circuit board "A" or "HI." 2. Test switch on test circuit board in wrong 3. IC A102 on circuit board "HI" shorted. Check this by interchanging IC with A202 from circuit board "LO." 4. IC A106 on circuit board "HI" shorted. Check this by interchanging it with IC A104. 5. Transistors Q103 or Q104 on circuit board "HI" incorrectly installed.

40 kHz TRANSMITTER ALIGNMENT

PLL Emergency Transmitter

Refer to Figure 1-3 and Figure 3-1 (fold-out from Page 81) for the following steps.

( ) Set control R124 on circuit board "B" to its center of rotation.

( ) Connect a test lead from TP1 on the test circuit board to TP3 on circuit board "A."

( ) Connect a test lead from TP4 on the test circuit board to the plus (+) lead of capacitor C405 on circuit board "A."

( ) Connect a test lead from TP6 on the test circuit board to TP2 on circuit board "LO."

( ) Set the TEST switch on the test circuit board to RF.

( ) Connect the line cord coming from circuit board "A" to an AC outlet.

( ) Connect the line cord coming from circuit board "B" to an AC outlet.

( ) Push in switch SW101 on circuit board "B."

( ) Use the plastic alignment tool to slowly turn the slug in coil L101 on circuit board "B" in either direction (not more than one turn) until LED D2 stops flickering. At this point the LED will be dimly lit or out. (the point where it stops flickering is right in the center of the tuning range.) To make sure you have the correct point, very slightly turn the slug in both directions and note that the LED begins to flicker brightly.

( ) Disconnect the test lead from between TP2 on the circuit board "LO" and TP6 on the test circuit board.

( ) Connect a test lead from TP5 on the test circuit board to TP9 on circuit board "LO."

( ) Set the TEST switch on the test circuit board to DC.

( ) Turn control R124 on circuit board "B" full counterclockwise.

( ) Now turn control R124 very slowly clockwise until LED D2 lights. Mark this position.

( ) Continue to turn control R124 clockwise until LED D2 goes out. Mark this position.

( ) Set control R124 midway between these two marked positions.

( ) Disconnect the line cord (coming from circuit board "B") from the AC outlet.

( ) Disconnect the line cord (coming from circuit board "A") from the AC outlet.

( ) Disconnect all the test leads from between the test circuit board and circuit board "A," and from between the test circuit board and circuit board "LO."

PLL Early Warning Fire Detector

Refer to Figure 1-4 and Figure 3-1 (fold-out from Page 81) for the following steps.

NOTE: Make the following adjustments on circuit board "G." Do not connect the two fire detector circuit boards together.

( ) Set control R117 on circuit board "G" to its center of rotation.

( ) Connect a test lead between the plus (+) marked leads of capacitors C103 and C104 on circuit board "G" as shown.

( ) Connect a test lead from TP1 on the test circuit board to TP3 on circuit board "A."

( ) Connect a test lead from TP4 on the test circuit board to the plus (+) lead of capacitor C405 on circuit board "A."

( ) Connect a test lead from TP6 on the test circuit board to TP2 on circuit board "LO."

( ) Set the TEST switch on the test circuit board to RF.

( ) Connect the line cord coming from circuit board "A" to an AC outlet.

( ) Connect the line cord coming from circuit board "G" to an AC outlet.

( ) Use the plastic alignment tool to slowly turn the slug in coil L101 on circuit board "G" in either direction (not more than one turn) until LED D2 stops flickering. At this point the LED will be dimly lit or out. (The point where it stops flickering is right in the center of the tuning range.) To make sure you have the correct point, very slightly turn the slug in each direction and note that the LED begins to flicker brightly.

( ) Disconnect the test lead from between TP2 on circuit board "LO" and TP6 on the test circuit board.

( ) Connect a test lead from TP5 on the test circuit board to TP9 on circuit board "LO."

( ) Set the TEST switch on the test circuit board to DC.

( ) Turn control R117 on circuit board "G" full counterclockwise.

( ) Now turn control R117 very slowly clockwise until LED D2 lights. Mark this position.

( ) Continue to turn control R117 clockwise until LED D2 goes out. Mark this position.

( ) Set control R117 midway between these two marked positions.

( ) Disconnect the line cord (coming from circuit board "G") from the AC outlet.

( ) Disconnect the line cord (coming from circuit board "A") from the AC outlet.

( ) Disconnect all the test leads from between the test circuit board and circuit board "A," and from between the test circuit board and circuit board "LO."

( ) Disconnect the test lead that is connected between capacitors C103 and C104 on the circuit board "G."

This completes the "Alignment" of your system. Refer to the individual transmitter Manuals for "Final Assembly" instructions of each transmitter. Proceed to "Final Assembly" in this Manual for the Central Processor.

SHIFTING THE OPERATING FREQUENCY WITHIN THE TUNING RANGE

The operating frequency (40 kHz or 56 kHz) of each transmitter and the receivers is determined by the coil and its associated capacitor. The coils are preadjusted by the manufacturer and require only a slight "fine tuning" to insure that the transmitter and receiver are both operating on the same frequency.

It is possible, however, that the transmitter used to make the initial adjustments on the Central Processor (Pages 55 or 57) was incorrectly set. In this case, the receiver may be outside the range of adjustment of one or more other transmitter coils. (This could be the case if you are unable to locate the point where LED D2 goes out in the middle of its brightest flickering range.)

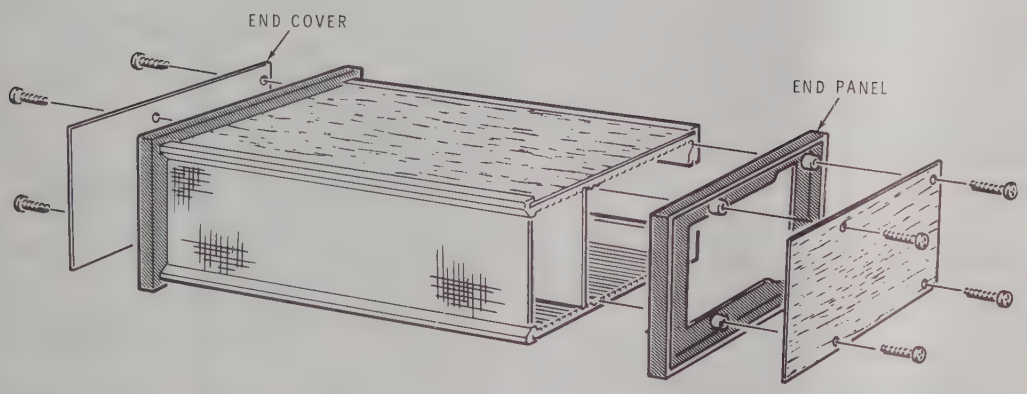
If you suspect that this is the case, check the slug inside the first transmitter's coil. (This is the transmitter that you used to make the initial 40 kHz or 56 kHz adjustment on Page 55 or 57, depending on which frequency transmitter you are having trouble with.) If the slug in the coil is unusually far in or out of the coil, turn the slug one-half turn away from this extreme position. Then repeat the alignment steps starting on Page 55 or 57 depending on which frequency transmitter you were having trouble with.

POSSIBLE CAUSE OF TROUBLE

TROUBLE	POSSIBLE CAUSE
LED D2 will not light when test lead is connected from TP6 on test circuit board to TP2 on circuit board "LO."	1. Test leads not connected to correct TP's on test circuit board or on circuit board "A" or "LO." 2. Test switch on test circuit board in wrong position. 3. Line cords from circuit board "A," or from circuit board "B" or "G" not connected to an AC outlet. 4. Switch SW101 on circuit board "B" not pushed in.

TROUBLE	POSSIBLE CAUSE
LED D2 will not light when test lead is connected from TP6 on test circuit board to TP2 on circuit board "LO."	5. Wrong transmitter or receiver circuit board. Check color dot on coil. Color dot on circuit board "LO" and on transmitter circuit board should be black. 6. Transmitter circuit board faulty. Refer to "In Case of Difficulty" section in Transmitter's Manual. 7. Jumper test lead on circuit board "G" not connected to the correct points.
LED D2 stays lit (will not flicker) when test lead is connected from TP6 on test circuit board to TP2 on circuit board "LO."	1. Control R124 (on circuit board "B") or control R117 (on circuit board "G") set too far clockwise. Turn control counterclockwise and see if LED flickers. 2. Transmitter circuit board defective. Refer to "In Case of Difficulty" section in Transmitters' Manual.
LED D2 will not go out during turning of slug with bright flickering on either side.	See section on "Shifting Operating Frequency within Tuning Range" on Page 65.
LED D2 will not light when test lead is connected from TP5 on test circuit board to TP9 on circuit board "LO."	1. Test leads not connected to correct TP's on test circuit board or circuit board "A" or "LO." 2. Test switch on test circuit board is in wrong position. 3. IC A202 on circuit board "LO" shorted. Check this by interchanging IC with IC A102 from circuit board "HI." 4. IC A204 on circuit board "LO" shorted. Check this by interchanging it with IC A104 from circuit board "HI." 5. IC A205 on circuit board "LO" shorted. Check this by interchanging it with IC A105 from circuit board "HI." 6. Transistors Q201 or Q202 on circuit board "LO" incorrectly installed.

FINAL ASSEMBLY



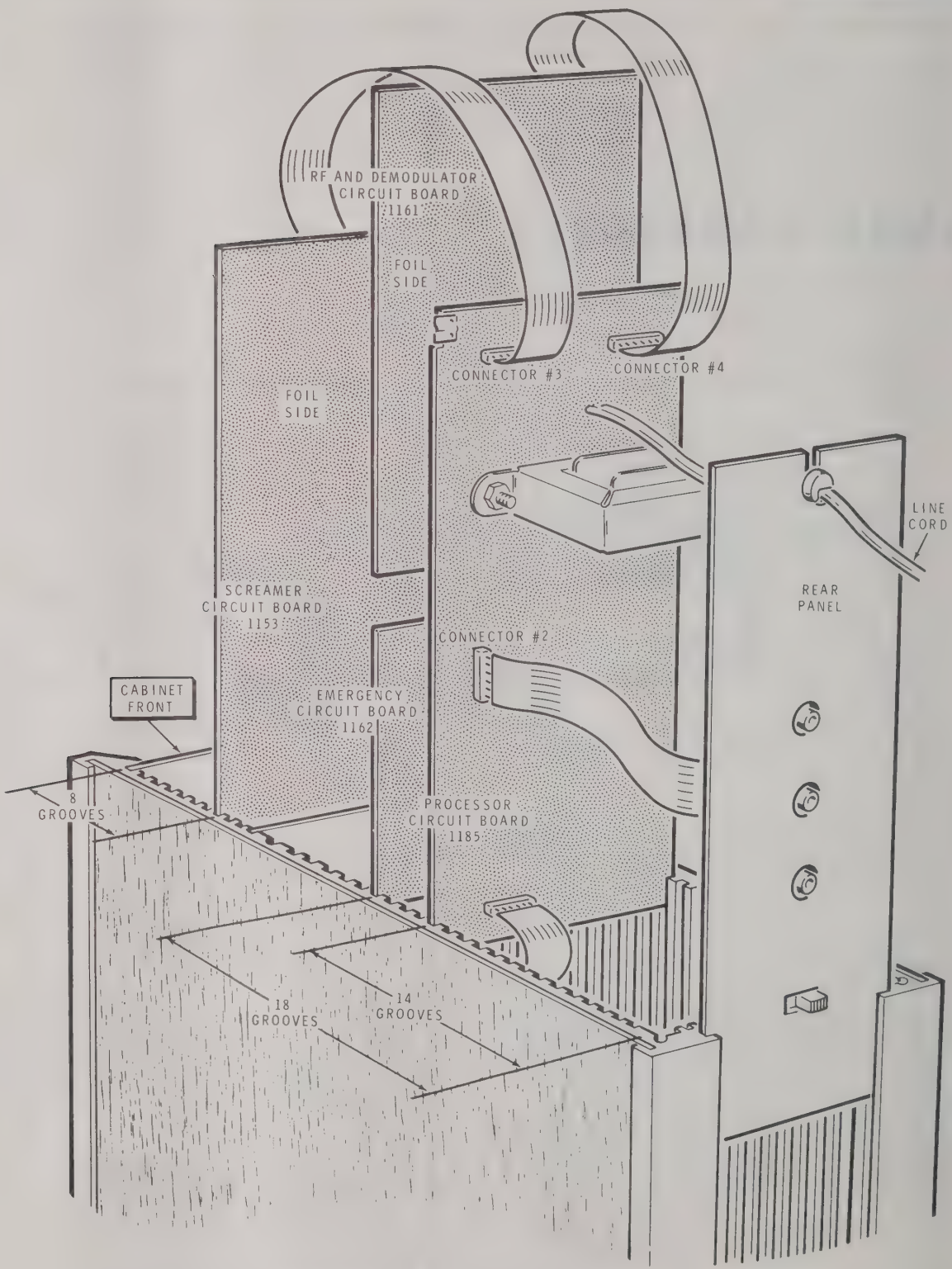
PICTORIAL 6-1

Refer to Pictorial 6-1 for the following steps.

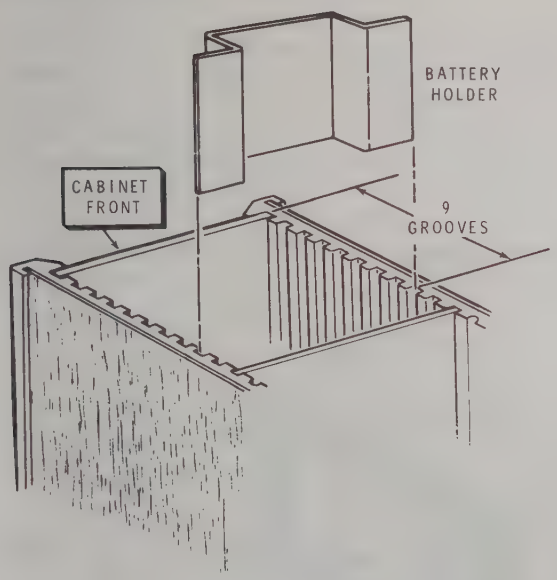
( ) Locate the central processor cabinet and remove the end cover marked "Open Other End." Note that the plastic end panel is permanently fastened to the cabinet.

( ) Remove the four screws and the end cover from the other end of the cabinet. If this end is already removed, proceed to the next step.

( ) Disconnect the rear panel, screamer circuit board (1153), and RF and demodulator circuit board (1161) from the processor circuit board (1185). This leaves only the emergency circuit board (1162) connected to the processor circuit board.



PICTORIAL 6-2



Detail 6-2A

Refer to Pictorial 6-2 for the following steps.

( ) Position the cabinet as shown. Then mark the grooves with a pencil as indicated in the Pictorial.

NOTE: In the following steps, only start the circuit boards into the cabinet. It is necessary that the rear panel and the first two circuit boards be started into the cabinet and connected together before they can be pushed all the way into the cabinet. Also, when you start a circuit board into the cabinet, refer to the Pictorial to see which groove the board slides into.

( ) Hold the processor circuit board and the emergency circuit board so that their foil sides face each other. Then slide the two circuit boards (cable first) into the cabinet for about 2".

( ) Slide the rear panel into the cabinet grooves about 2".

( ) Connect the 8-conductor cable coming from the rear panel to connector #2 on the processor circuit board.

NOTE: In the following step, it is easy for a cable to become partially disconnected while you install the circuit boards in the cabinet. After you perform the next step, check for this possibility.

( ) Slide the rear panel, processor circuit board, and the emergency circuit board all the way into the cabinet. NOTE: Be careful that you do not damage the cable coming from the rear panel as it slides past the outside corner of the cabinet.

NOTE: The circuit boards should slide easily into the grooves of the cabinet. If any circuit board does not slide easily, make sure it is in the same groove on top as it is on the bottom.

( ) Position the RF and demodulator circuit board so its foil side faces the foil side of the processor circuit board. Then slide the circuit board all the way into the cabinet in the same grooves that the emergency circuit board is in.

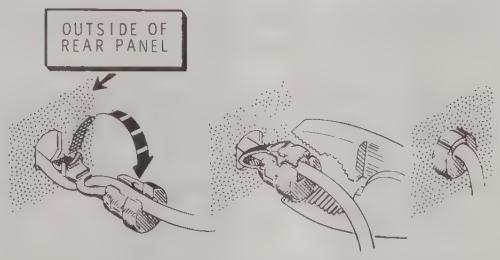
( ) Connect a 6-conductor cable from the RF and demodulator circuit board to connector #4 on the processor circuit board.

( ) Refer to Detail 6-2A and slide the battery holder into the cabinet, nine grooves from the front of the cabinet. The circuit board that will be installed in the next two steps will push the battery holder to the other end of the cabinet.

( ) Set the SPEAKER switch on the screamer circuit board to ON.

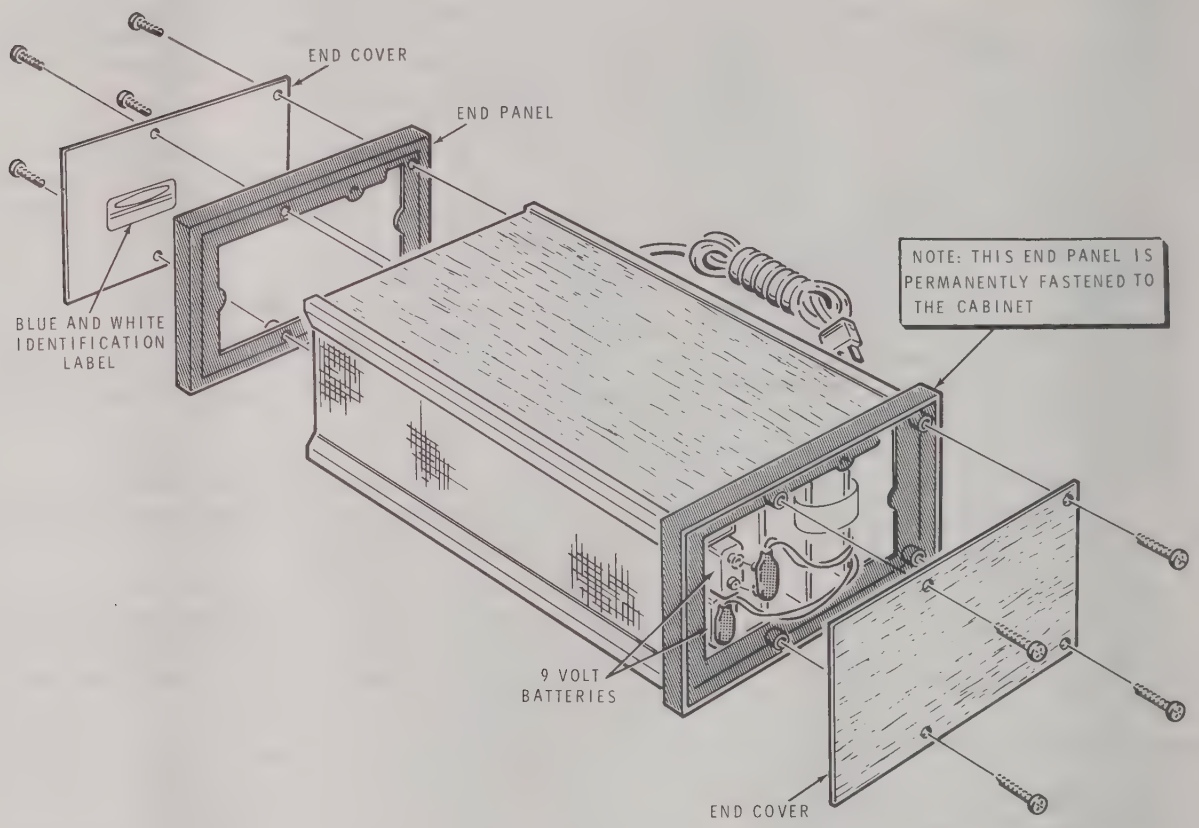
( ) Slide the screamer circuit board into the cabinet so that the speaker faces the front of the cabinet.

( ) Connect a 6-conductor cable from the screamer circuit board to connector #3 on the processor circuit board.



Detail 6-2B

( ) Refer to Detail 6-2B and then position the line cord into the opening in the rear panel. Install the line cord strain relief on the line cord.


END COVER
END PANEL
NOTE: THIS END PANEL IS PERMANENTLY FASTENED TO THE CABINET
BLUE AND WHITE IDENTIFICATION LABEL
9 VOLT BATTERIES
END COVER

PICTORIAL 6-3

Refer to Pictorial 6-3 for the following steps.

( ) Check the Battery switch on the rear panel to make sure it is in the OFF position.

( ) Connect a 9-volt battery to each battery connector. Be sure to install the connector properly.

( ) Position the batteries into the battery holder as shown so the connector end faces out.

( ) Reinstall the end cover (the end panel is permanently attached) onto the battery compartment end of the cabinet. Use the four screws that were removed from the end cover earlier.

( ) Locate the blue and white identification label. Peel the protective paper off the back of the label. Then press the label to the inside of the other end cover. Refer to the numbers on this label in any correspondence you may have to the Heath Company concerning this unit.

( ) Reinstall the other end panel and both end covers onto the cabinet. Use the four screws that were removed earlier.

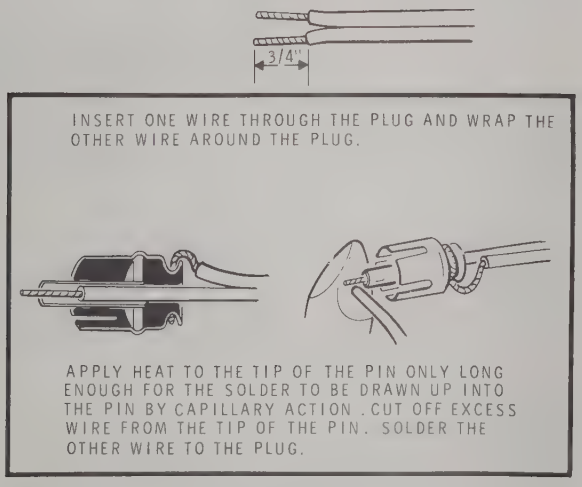
This completes the "Final Assembly." Proceed to "Operation."

PHONO PLUG INSTALLATION

A phono plug has been supplied with your kit for connecting an external speaker to the Central Processor. The type and size of wire that you will use will depend on your particular installation. However, for convenience we recommend a lamp cord type of wire. Refer to the following chart to determine the size of wire you need. The greater the distance between the Central Processor and the external speaker, the larger the wire size (smaller number) you will need.

WIRE SIZE	DISTANCE
#24	40 ft.
#22	60 ft.
#20	100 ft.
#18	150 ft.
#16	250 ft.
#14	over 250 ft.

Refer to Pictorial 6-4 for information on how to install the phono plug onto speaker wire.


3/4"
INSERT ONE WIRE THROUGH THE PLUG AND WRAP THE OTHER WIRE AROUND THE PLUG.
APPLY HEAT TO THE TIP OF THE PIN ONLY LONG ENOUGH FOR THE SOLDER TO BE DRAWN UP INTO THE PIN BY CAPILLARY ACTION . CUT OFF EXCESS WIRE FROM THE TIP OF THE PIN. SOLDER THE OTHER WIRE TO THE PLUG.

PICTORIAL 6-4

OPERATION

In some of the following steps the alarm should sound. In each of these steps, the next step will tell you how to turn the alarm off again. NOTE: Disregard any of the following sections that refer to Transmitters that you do not have.

( ) Make sure that the Central Processor and all of the accessory transmitter's line cords are disconnected from the AC outlets.

( ) Connect the central processor line cord to an AC outlet. In approximately two minutes the LED on the rear panel should light.

( ) Set the BATTERY switch on the rear panel of the Central Processor to ON.

( ) Disconnect the central processor line cord. The alarm should sound in approximately 20 seconds or less.

( ) Connect the central processor line cord to an AC outlet, the alarm should stop. In approximately two minutes the LED on the rear panel should light.

( ) Connect the on-off transmitter line cord to an AC outlet. Make sure the pushbutton switch is out.

NOTE : In the following steps intrusion alarm signals will sound, after the delays given in the steps, only if the Central Processor has been "enabled". In this case the LED on the rear panel will be lit. Emergency or fire alarm signals, however, will sound without delay whether the LED is lit or not.

PLL TRANSMITTER

( ) Connect the PLL transmitter line cord to an AC outlet. Make sure the pushbutton is in the out position.

( ) Push the PLL transmitter pushbutton in for about five seconds; then reset the pushbutton to its out position. The central processor alarm should sound approximately 25 seconds later.

( ) Push the on-off transmitter pushbutton to in. The alarm should stop and the LED on the rear panel of the central processor should go out.

( ) Disconnect the PLL transmitter line cord.

( ) Set the on-off transmitter pushbutton to the out position but do not disconnect the line cord.

NOTE: For information on how to use sensors with your PLL Transmitter, refer to your PLL Transmitter Manual.

EMERGENCY TRANSMITTER

( ) Connect the emergency transmitter line cord to an AC outlet.

( ) Push the emergency transmitter pushbutton in. The central processor alarm should sound.

( ) Push the emergency transmitter pushbutton to the out position. The alarm should stop within two minutes.

( ) Disconnect the emergency transmitter line cord.

PLL ULTRASONIC DETECTOR

( ) Connect the PLL ultrasonic detector line cord to an AC outlet and wait 30 seconds. Then walk in front of the detector. The central processor should sound approximatley 25 seconds later.

( ) Push the on-off transmitter pushbutton in; the alarm should stop.

( ) Disconnect the PLL ultrasonic detector line cord.

( ) Reset the on-off transmitter pushbutton to OFF (out). The LED on the rear panel of the Central Processor should light in about two minutes.

( ) Disconnect the on-off transmitter line cord.

CENTRAL PROCESSOR

( ) Disconnect the central processor line cord. The alarm should sound in approximately 20 seconds.

( ) Plug in the central processor line cord. The alarm should stop and the LED on the rear panel should go out.

( ) Set the BATTERY switch on the rear panel of the Central Processor to OFF.

( ) Disconnect the central processor line cord.

External Speaker

The external speaker output on the rear panel of the Central Processor is for connection of an external 8 Ω speaker. The position of the SPEAKER switch on the screamer circuit board does not affect the external speaker output.

AUX (auxiliary) Output

The AUX output on the rear panel of the Central Processor closes a separate (floating) circuit with a series (protective) resistance of 100 Ω. This is used for activating low power control circuitry.

BATTERY WARNING

The batteries will supply power to the Central Processor so it will sound an alarm if a power failure should occur. But it will only sound an alarm if the unit is "ARMED." (The LED on the rear panel is lit when the unit is armed.)

However, if you disable the Central Processor by turning the On-Off Transmitter on (Central Processor not armed: LED on rear panel not lit), and then a power failure should occur, no alarm will sound but the batteries will discharge anyway.

Therefore, leave the battery switch in the OFF position except when you want protection from power line failure.

IN CASE OF DIFFICULTY

This part of the Manual will help you locate and correct any difficulty that may occur in your Central Processor. This information is divided into two sections. The first section, "General," is a list of visual checks and precautions for bench testing. Follow the visual checks very carefully since many difficulties can be corrected right here. The second section consists of a "Troubleshooting Chart." The visual checks can also be helpful in this section for locating difficulty.

GENERAL

VISUAL CHECKS

1. About 90% of the kits that are returned for repair, do not function properly due to poor connections and soldering. Therefore, many troubles can be eliminated by a careful inspection of connections to make sure they are soldered as described in the Soldering section of the "Kit Builders Guide." Reheat any doubtful connections.

2. Check to be sure that all transistors are in their proper locations, and are installed correctly.

3. Check the value of each part. Be sure that the proper part has been wired into the circuit, as shown in the Pictorial diagrams and as called out in the wiring instructions. It would be easy, for example, to install a 2200 Ω (red-red-red) resistor in a step that calls for a 220 Ω (red-red-brown) resistor.

4. Check all component leads connected to the circuit boards. Make sure the leads do not extend through the circuit board and make contact with other connections or parts such as the metal case.

NOTE: In an extreme case where you are unable to resolve a difficulty, refer to the "Customer Service" information inside the rear cover of the Manual. Your Warranty is located inside the front cover.

PRECAUTIONS FOR BENCH TESTING

1. Be cautious when testing transistor and IC circuits. Excessive voltage or current can destroy a transistor or IC instantly.

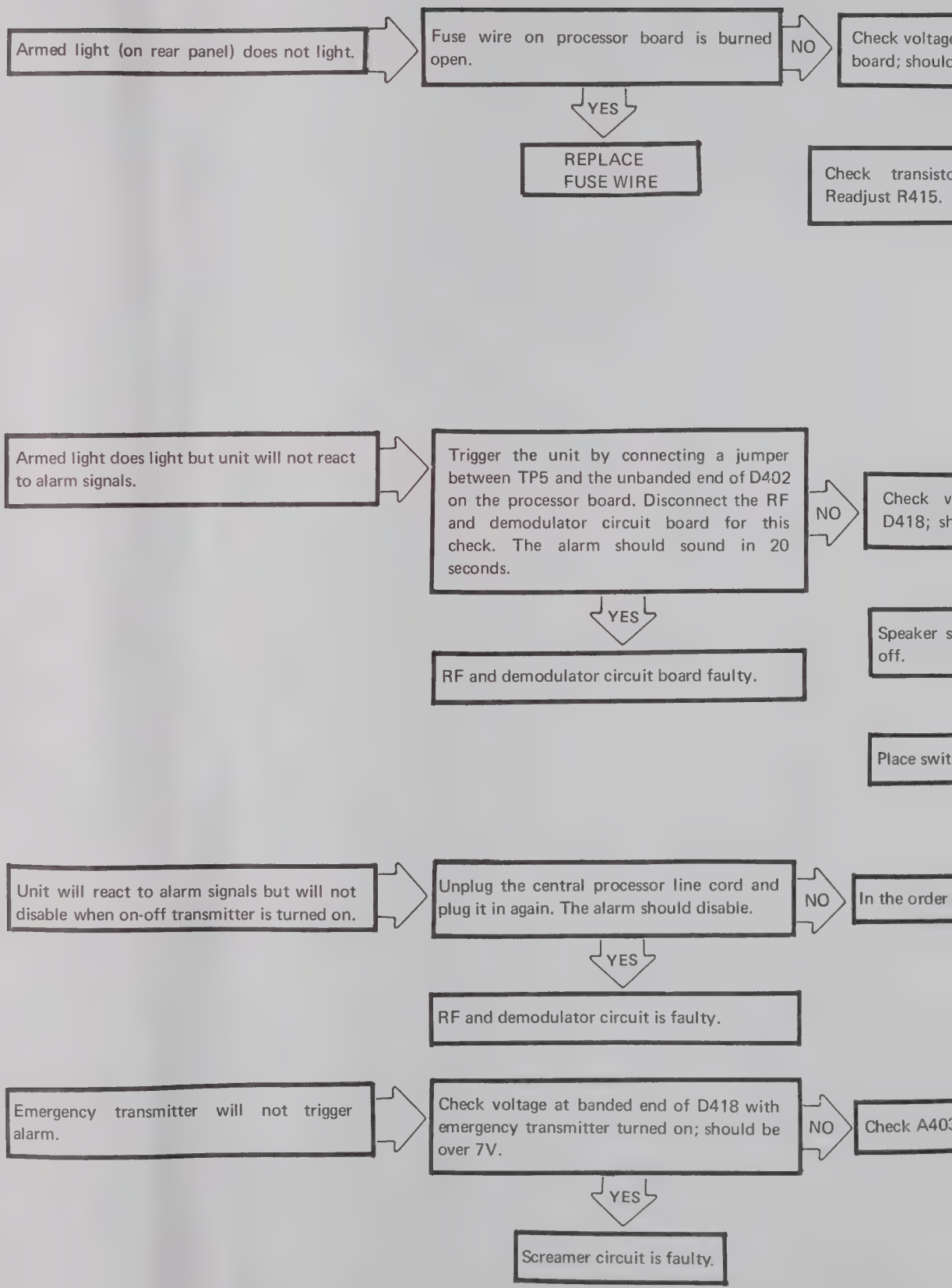
2. Be sure you do not short any terminals to ground when making voltage measurements. If the probe should slip, for example, and short out a bias or voltage supply point, it is almost certain to damage one or more transistors, diodes, or IC's.

3. Do not remove transistors or IC's while the Central Processor is connected to an AC outlet, as this could cause damage.

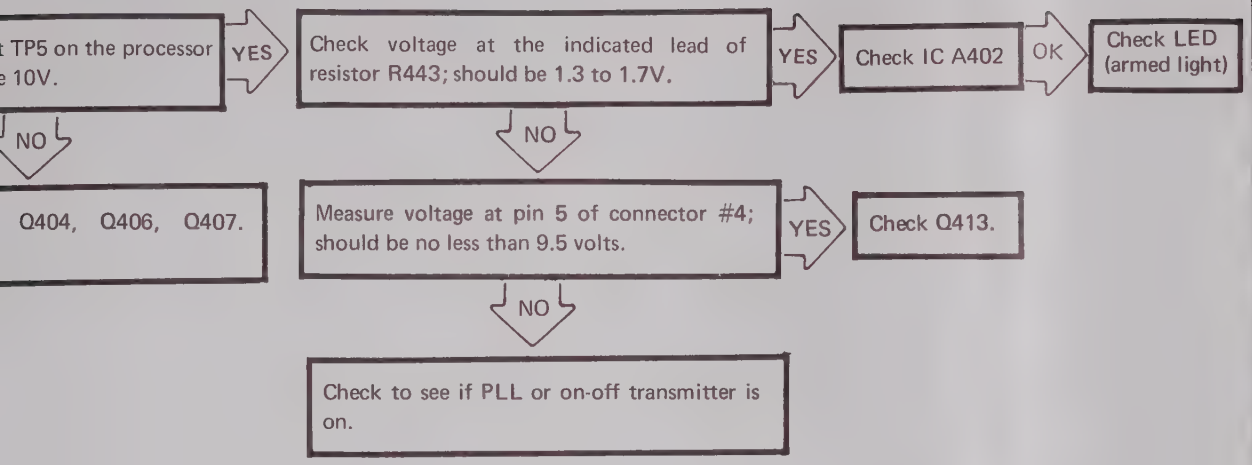
4. Do not remove circuit boards while the Central Processor is connected to an AC outlet.

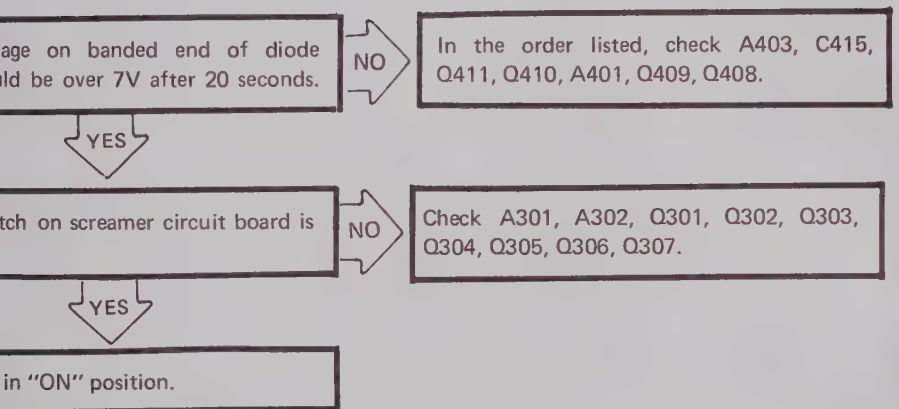
CAUTION: The full AC line voltage is present at several points on the processor circuit board when the line cord is connected to an AC outlet, see Figure 3-1 (fold-out from Page 81). Be careful to avoid electrical shock when performing the checks described.

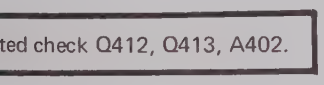
TROUBLESH

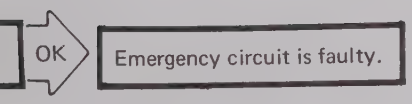

Armed light (on rear panel) does not light.
Fuse wire on processor board is burned open.
NO
Check voltage
board; should
YES
REPLACE
FUSE WIRE
Check transisto
Readjust R415.
Armed light does light but unit will not react to alarm signals.
Trigger the unit by connecting a jumper between TP5 and the unbanded end of D402 on the processor board. Disconnect the RF and demodulator circuit board for this check. The alarm should sound in 20 seconds.
NO
Check v
D418; sh
YES
RF and demodulator circuit board faulty.
Speaker s
off.
Place swit
Unit will react to alarm signals but will not disable when on-off transmitter is turned on.
Unplug the central processor line cord and plug it in again. The alarm should disable.
NO
In the order
YES
RF and demodulator circuit is faulty.
Emergency transmitter will not trigger alarm.
Check voltage at banded end of D418 with emergency transmitter turned on; should be over 7V.
NO
Check A403
YES
Screamer circuit is faulty.

OOTING CHART


t TP5 on the processor
e 10V.
YES
Check voltage at the indicated lead of resistor R443; should be 1.3 to 1.7V.
YES
Check IC A402
OK
Check LED (armed light)
NO
NO
Q404, Q406, Q407.
Measure voltage at pin 5 of connector #4; should be no less than 9.5 volts.
YES
Check Q413.
NO
Check to see if PLL or on-off transmitter is on.


age on banded end of diode
ld be over 7V after 20 seconds.
NO
In the order listed, check A403, C415, Q411, Q410, A401, Q409, Q408.
YES
tch on screamer circuit board is
NO
Check A301, A302, Q301, Q302, Q303, Q304, Q305, Q306, Q307.
YES
in "ON" position.





INSTRUMENT ALIGNMENT

Only persons familiar with instrument alignment should perform the following adjustments. The transmitters will be used as a signal source for the Central Processor; therefore, it is necessary to align the transmitters first. If you have just purchased a new transmitter to add to your already existing system, you should realign your Central Processor also.

WARNING: The transmitters, except the fire detector, do not contain transformer power supplies. Therefore, it is very important that you use an isolation transformer between the transmitters and the AC power line to prevent hazardous electrical shock. The Central Processor does have a transformer power supply.

Equipment needed:

Frequency Counter
Isolation Transformer

PLL EMERGENCY TRANSMITTER

Refer to Figure 1-3 (fold-out from Page 81) for the following steps.

( ) Connect the common lead of the frequency counter to the minus (–) lead of a capacitor C106.

( ) Connect the signal lead of the frequency counter to the emitter lead of transistor Q103.

WARNING: When the emergency transmitter line cord is connected to an AC outlet, dangerous AC voltage is present on the emergency transmitter circuit board. Be especially careful around the line cord and fuse area of the circuit board. Figure 1-3 (fold-out from Page 81) shows the area of dangerous voltage.

( ) Connect the emergency transmitter line cord to the isolation transformer and plug in the isolation transformer.

( ) Push the transmitter pushbutton to ON (in).

( ) Turn the slug in coil L101 to obtain a frequency of 40 kHz on the counter.

( ) Disconnect the frequency counter from the emitter of transistor Q103 and connect it to the indicated lead of resistor R123.

( ) Adjust control R124 to obtain a 13 Hz frequency on the counter.

( ) Reset the transmitter pushbutton to OFF (out) and disconnect the line cord.

( ) Disconnect the frequency counter from the transmitter.

This completes the "Emergency Transmitter Alignment."

PLL EARLY WARNING FIRE DETECTOR

Refer to Figure 1-4 (fold-out from Page 81) for the following steps.

( ) Connect the common lead of the frequency counter to the minus (–) lead of a capacitor C103.

( ) Connect the signal lead of the frequency counter to the emitter lead of transistor Q103.

( ) Connect a test lead between the plus (+) marked leads of capacitors C103 and C104.

NOTE: In the following steps, do not connect the two fire detector circuit boards together. Make the adjustments on the transmitter circuit board of the fire detector (#1673).

WARNING: When the fire detector line cord is connected to an AC outlet, dangerous AC voltage is present on the circuit board. Be especially careful around the line cord and fuse area of the circuit board. Figure 1-4 (fold-out from Page 81) shows the area of dangerous voltage.

( ) Connect the fire detector transmitter circuit board (#1673) line cord to an AC outlet.

( ) Turn the slug in coil L101 to obtain a frequency of 40 kHz on the counter.

( ) Disconnect the frequency counter from the emitter of transistor Q103 and connect it to the indicated lead of resistor R116.

( ) Adjust control R117 to obtain a 13 Hz frequency on the counter.

( ) Disconnect the line cord from the isolation transformer.

( ) Disconnect the test lead from capacitors C103 and C104.

( ) Disconnect the frequency counter from the fire detector.

This completes the "Fire Detector Alignment."

PLL ON-OFF TRANSMITTER

Refer to Figure 1-5 (fold-out from Page 81) for the following steps.

( ) Connect the common lead of the frequency counter to the minus (–) lead of capacitor C106.

( ) Connect the signal lead of the frequency counter to the emitter lead of transistor Q103.

WARNING: When the on-off transmitter line cord is connected to an AC outlet, dangerous AC voltage is present on the on-off transmitter circuit board. Be especially careful around the line cord and fuse area of the circuit board. Figure 1-5 (fold-out from Page 81) shows the area of dangerous voltage.

( ) Connect the on-off transmitter line cord to the isolation transformer and plug in the isolation transformer.

( ) Push the transmitter pushbutton to ON (in).

( ) Turn the slug in coil L101 to obtain a frequency of 56 kHz on the counter.

( ) Disconnect the frequency counter from the emitter of transistor Q103 and connect it to the indicated lead of resistor R123.

( ) Adjust control R124 to obtain a frequency of 19 Hz on the counter.

( ) Reset the transmitter pushbutton to OFF (out) and disconnect the line cord.

( ) Disconnect the frequency counter from the Transmitter.

This completes the "On-Off Transmitter Alignment."

PLL TRANSMITTER

Refer to Figure 1-6 (fold-out from Page 81) for the following steps.

( ) Refer to Figure 1-6 and connect a test lead to the indicated leads of resistors R123 and R129.

( ) Connect the common lead of the frequency counter to the minus (–) lead of capacitor C106.

( ) Connect the signal lead of frequency counter to the emitter of transistor Q103.

WARNING: When the PLL transmitter line cord is connected to an AC outlet, dangerous AC voltage is present on the on-off transmitter circuit board. Be especially careful around the line cord and fuse area of the circuit board. Figure 1-6 (fold-out from Page 81) shows the area of dangerous voltage.

( ) Connect the PLL transmitter line cord to the isolation transformer and plug in the isolation transformer.

( ) Turn the slug in coil L101 to obtain a frequency of 56 kHz on the counter.

( ) Disconnect the frequency counter from the emitter of transistor Q103 and connect it to the indicated lead of resistor R118.

( ) Adjust control R119 to obtain a frequency of 13 Hz on the counter.

( ) Disconnect the transmitter line cord.

( ) Disconnect the frequency counter from the transmitter.

( ) Remove the test lead from the leads of R123 and R129.

This completes the "PLL Transmitter Alignment."

PLL ULTRASONIC DETECTOR

Refer to Figure 1-7 (fold-out from Page 81) for the following steps.

( ) Make sure that the ultrasonic circuit board is not connected to the PLL transmitter circuit board.

( ) Connect a test lead between TP22 and TP7 on the PLL transmitter circuit board.

( ) Connect the common lead of the frequency counter to the minus (–) lead of capacitor C207.

( ) Connect the signal lead of the frequency counter to the emitter of transistor Q208.

WARNING: When the PLL ultrasonic detector line cord is connected to an AC outlet, dangerous AC voltage is present on the on-off transmitter circuit board. Be especially careful around the line cord and fuse area of the circuit board. Figure 1-7 (fold-out from Page 81) shows the area of dangerous voltage.

( ) Connect the transmitter line cord to the isolation transformer and plug in the isolation transformer.

( ) Turn the slug in coil L203 to obtain a frequency of 56 kHz on the counter.

( ) Disconnect the frequency counter from the emitter of transistor Q208 and connect it to the indicated lead of resistor R237.

( ) Adjust control R241 to obtain a frequency of 13 Hz on the counter.

( ) Disconnect the transmitter line cord.

( ) Remove the test lead from between TP22 and TP7.

( ) Disconnect the frequency counter from the transmitter.

This completes the "PLL Ultrasonic Detector Alignment."

CENTRAL PROCESSOR

Equipment needed:

Oscilloscope
High impedance voltmeter

Refer to Figure 3-1 (fold-out from Page 81) for the following steps.

( ) Set the SPEAKER switch on the screamer circuit board (#1153) to OFF.

( ) Set the BATTERY switch on the rear panel to OFF.

( ) Connect the common lead of the voltmeter to TP3 and the probe to TP5 on the processor circuit board (#1185).

WARNING: When the central processor line cord is connected to an AC outlet, dangerous AC voltage is present on the processor circuit board. Be especially careful around the line cord and fuse area of the circuit board. Figure 3-1 (fold-out from Page 81) shows the area of dangerous voltage.

( ) Connect the central processor line cord to an AC outlet.

( ) Adjust control R415 on the processor circuit board (#1185) to obtain a 10 volt reading on the voltmeter.

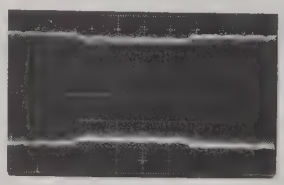
( ) Connect the common lead of the oscilloscope to TP3 on the processor circuit board (#1185).

( ) Connect the probe of the oscilloscope to TP2 on the RF and demodulator circuit board (#1161).

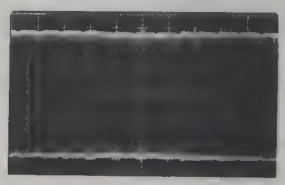
( ) Connect the line cord of either the on-off transmitter or the PLL transmitter to an AC outlet. NOTE: Do not use the isolation transformer. Be sure to connect the jumper between the indicated leads of resistors R123 and R129 on the PLL transmitter.

( ) Push the pushbutton on the on-off transmitter or PLL transmitter to its IN position.

( ) Adjust transformer T101 on the RF and demodulator circuit board (#1161) to obtain a maximum amplitude waveform that is free of notching as shown below.



WRONG



RIGHT

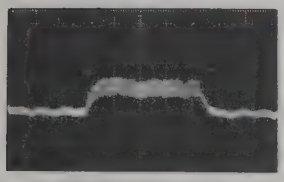
( ) Disconnect the oscilloscope probe from TP2 on the RF and demodulator circuit board.

( ) Connect the probe of the voltmeter to TP5 on the RF and demodulator circuit board.

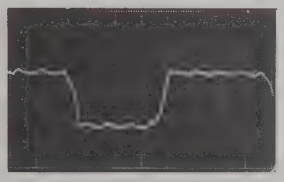
( ) Set control R112 on the RF and demodulator circuit board (#1161) full clockwise (as viewed from its rotating side).

( ) Now turn control R112 counterclockwise until you obtain a 2 volt reading on the voltmeter.

( ) Touch the probe of the oscilloscope to TP5 on the RF and demodulator circuit board (#1161). The waveform should look like the one shown at the right below. If the waveform looks like the one shown at the left below, repeat the previous adjustment of control R112.



WRONG



RIGHT

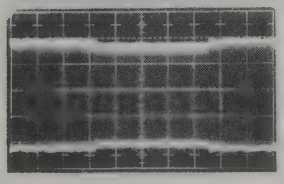
( ) Disconnect the on-off transmitter or PLL transmitter (whichever was used) line cord from the AC outlet.

NOTE: If you did not purchase an emergency transmitter or fire detector, disregard the following steps and proceed to "Transmitters."

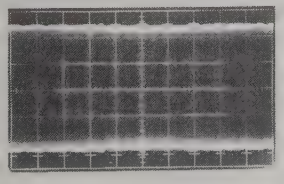
( ) Connect the probe of the oscilloscope to TP2 on the emergency circuit board (#1162. NOTE: This is not the emergency transmitter circuit board.)

( ) Connect the line cord of the emergency transmitter to an AC outlet and push the pushbutton in. NOTE: Do not use the isolation transformer.

( ) Adjust transformer T201 on the emergency circuit board (#1162) to obtain a maximum amplitude waveform that is free of notching as shown below.



WRONG



RIGHT

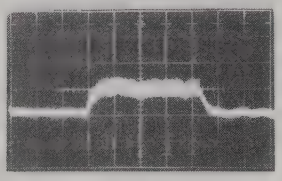
( ) Disconnect the oscilloscope probe from TP2 on the emergency circuit board.

( ) Connect the probe of the voltmeter to TP5 on the emergency circuit board (#1162).

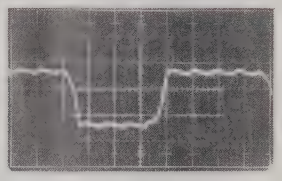
( ) Set control R212 on the emergency circuit board (#1162) full clockwise (as viewed from its rotating side).

( ) Now turn control R212 counterclockwise until you obtain a 2 volt reading on the voltmeter.

( ) Touch the oscilloscope probe to TP5 on the emergency circuit board (#1162). The waveform should look like the one shown at the right below. If the waveform looks like the one shown at the left below, repeat the previous adjustment of control R212.



WRONG



RIGHT

( ) Disconnect the oscilloscope from the Central Processor.

TRANSMITTERS

NOTE: In the following steps, perform only the sections that apply to transmitters that you have. Disregard any sections for transmitters that you do not have.

PLL Transmitter

( ) Connect the PLL transmitter line cord to an AC outlet. Do not use an isolation transformer.

( ) Connect the voltmeter probe to TP9 on the RF and demodulator circuit board (#1161).

( ) Push the pushbutton on the PLL Transmitter in.

( ) Adjust control R119 on the PLL transmitter circuit board (#1221) in either direction to get a 2.5 volt reading on the voltmeter. NOTE: There is a range of movement of the control that will give you a 2.5 volt reading. Set control R119 in the middle of this range. NOTE: The transmitter will emit burst of signal of about 4 to 5 seconds duration every 15-18 seconds if a shorting jumper is not connect between the lead of R123 and the lead of R129 as shown in Figure 1-5.

Disconnect the PLL transmitter line cord and set the Transmitter aside.

PLL Ultrasonic Detector

NOTE: For the following steps, make sure that the two PLL ultrasonic detector circuit boards are connected together by an 8-conductor cable.

( ) Connect the PLL ultrasonic detector line cord to an AC outlet.

( ) Connect the voltmeter probe to TP9 on the RF and demodulator circuit board (#1161).

( ) Adjust control R241 on the PLL circuit board (#1365, one of the PLL ultrasonic detector circuit boards) in either direction to get a 2.5-volt reading on the voltmeter. NOTE: There is a range of movement of the control that will give you a 2.5-volt reading. Set control R241 in the middle of this range. NOTE: The PLL ultrasonic detector will emit signals for a period of approximately 10 seconds when movement is detected in front of the ultrasonic detector circuit board. Then the movement must stop, so that the LED will go out before more signals can be transmitted.

( ) Disconnect the PLL ultrasonic detector line cord and set the unit aside.

ON-OFF Transmitter

( ) Connect the On-Off transmitter line cord to an AC outlet.

( ) Connect the voltmeter probe to TP10 on the RF and demodulator circuit board.

( ) Make sure that the pushbutton on the On-Off Transmitter is in the ON (in) position.

( ) Adjust control R124 on the On-Off transmitter to obtain a "0" volt reading on the voltmeter. NOTE: There is a range of movement of the control that will give you a "0" volt reading. Set control R124 in the middle of this range.

( ) Disconnect the on-off transmitter line cord and set the Transmitter aside.

Emergency Transmitter

( ) Connect the emergency transmitter line cord to an AC

( ) Connect the voltmeter probe to TP9 on the emergency circuit board. NOTE: This is not the emergency transmitter circuit board.

( ) Push the push button on the emergency transmitter circuit board to ON (in).

( ) Adjust control R124 on the emergency transmitter circuit board to obtain an 8 volt reading. NOTE: There is a range of movement of the control that will give you an 8 volt reading. Set the control R124 in the middle of this range.

( ) Disconnect the emergency transmitter line cord and set the pushbutton to OFF (out).

( ) Disconnect the central Processor line cord.

( ) Remove the voltmeter leads from the Central Processor.

Refer to the "Final Assembly" instruction in each Manual for information on assembling your transmitters and Central Processor in their cabinets.

Fire Detector

NOTE: Do not connect the two fire detector circuit boards together.

( ) Connect a test lead between the plus (+) marked leads of capacitor C103 and C104 on the transmitter circuit board (#1673).

( ) Connect the fire detector line cord to an AC outlet.

( ) Connect the voltmeter probe to TP9 on the emergency circuit board. NOTE: This is not the emergency transmitter circuit board.

( ) Adjust control R117 on the fire detector circuit board to obtain an 8 volt reading. NOTE: There is a range of movement of the control that will give you an 8 volt reading. Set the control R117 in the middle of this range.

( ) Disconnect the fire detector line cord.

( ) Remove the test lead from between capacitors C103 and C104.

Set the Fire Detector aside.

( ) Remove the voltmeter leads from the Central Processor and disconnect the Central Processor line cord.

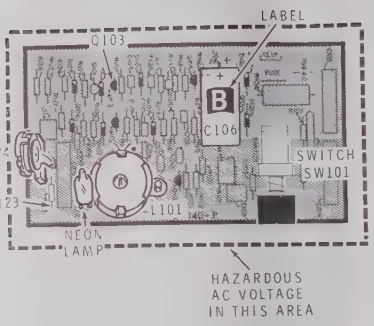
Refer to the "Final Assembly" instructions in each Manual for information on assembling your transmitters and Central Processor in their cabinets.

SPECIFICATIONS

Carrier Frequency	Emergency: 40 kHz. Alarm: 56 kHz.
Range	Anywhere on the same Secondary of a power distribution transformer.
Exit Time	Approximately 2 minutes.
Entry Time	Approximately 20 seconds.
Emergency Activation Time	Approximately two seconds.
Disable Time	Approximately 1.5 seconds.
Outputs	External Speaker Normally open relay contacts. Dialer Activate.
Sound Source	Internal speaker, or optional external speaker. (External speaker output: Capable of 12 watts into an 8 ohm speaker.)
Sound Level at 10 Feet, Internal Speaker	88 dB.
Power Requirements	115 volts AC, 60 Hz (2 watts).
Dimensions	10-7/8" x 6" x 4-1/2".
Weight	15 lbs.

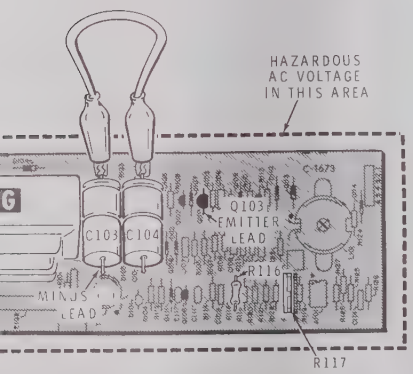
PLL

The Heath Company reserves the right to discontinue products and to change specifications at any time without incurring any obligation to incorporate new features in products previously sold.



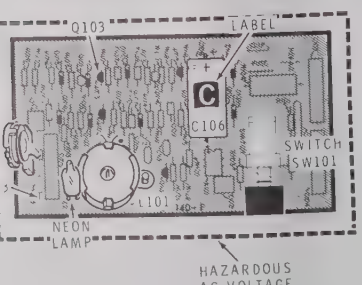
PLL EMERGENCY
(#1140)

Figure 1-3



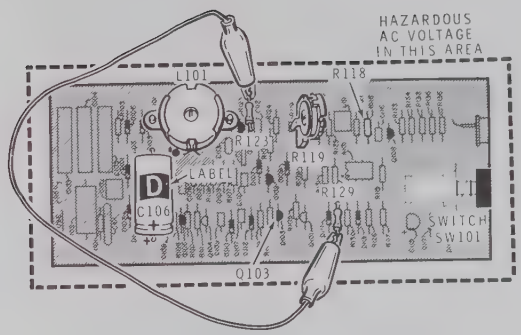
EARLY WARNING FIRE DETECTOR
RANSMITTER CIRCUIT BOARD
(#1673)

Figure 1-4



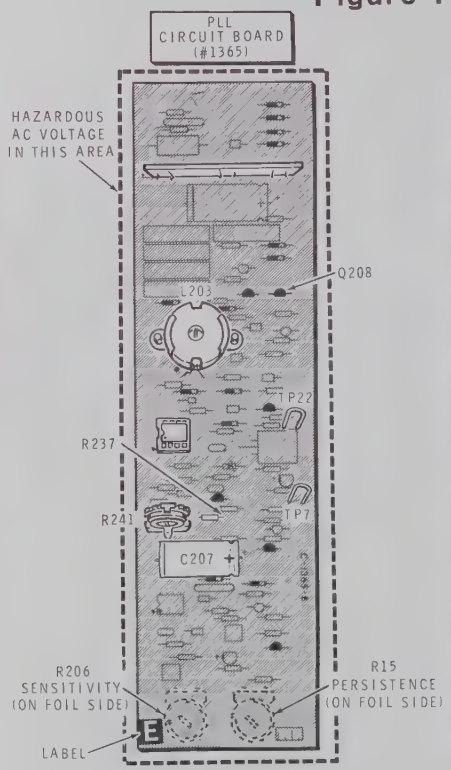
PLL ON-OFF TRANSMITTER
(#1140)

Figure 1-5



PLL TRANSMITTER
(#1221)

Figure 1-6



PLL CIRCUIT BOARD
(#1365)

ULTRASONIC CIRCUIT BOARD
(#1364)

ULTRASONIC DETECTOR

Figure 1-7

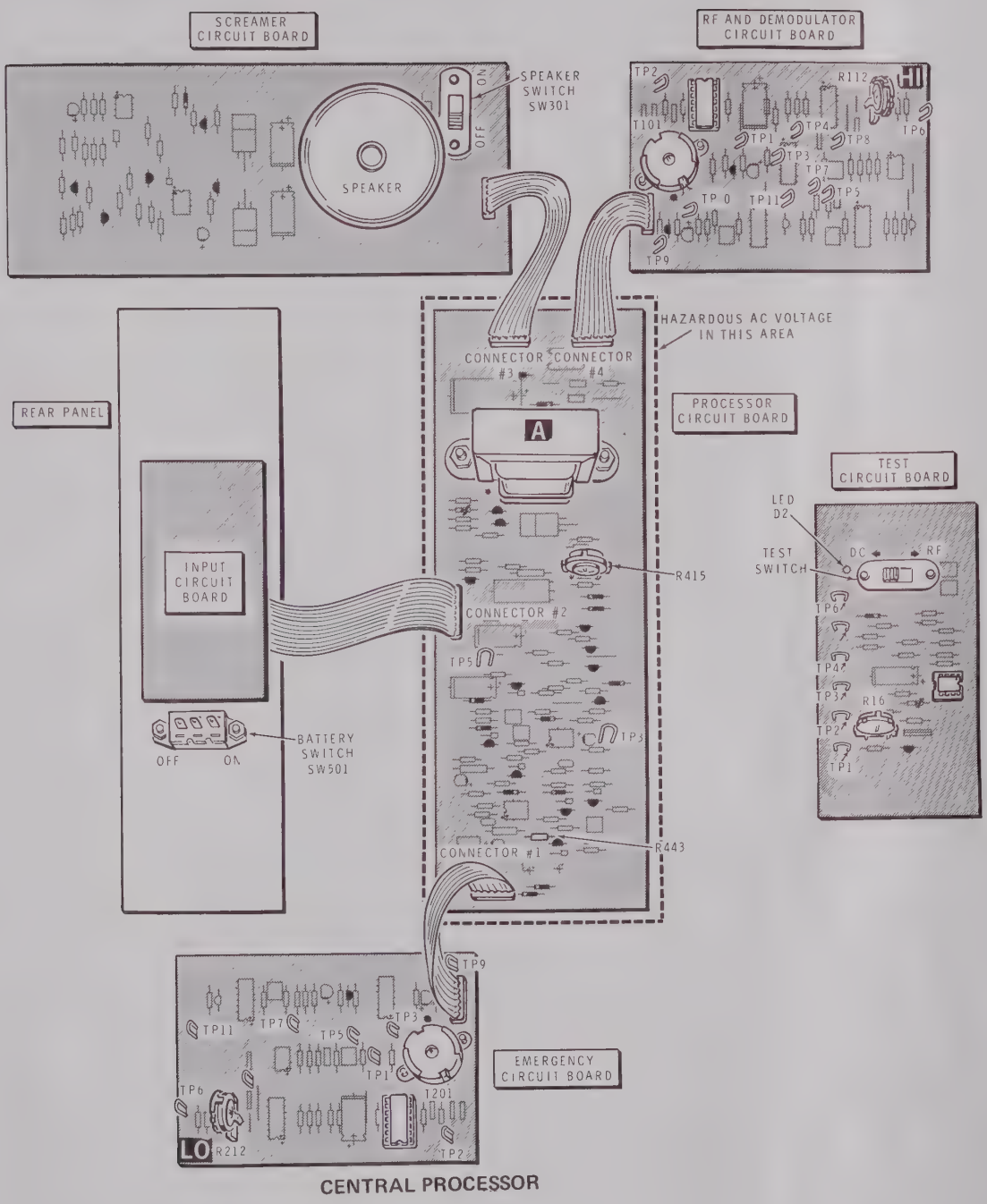
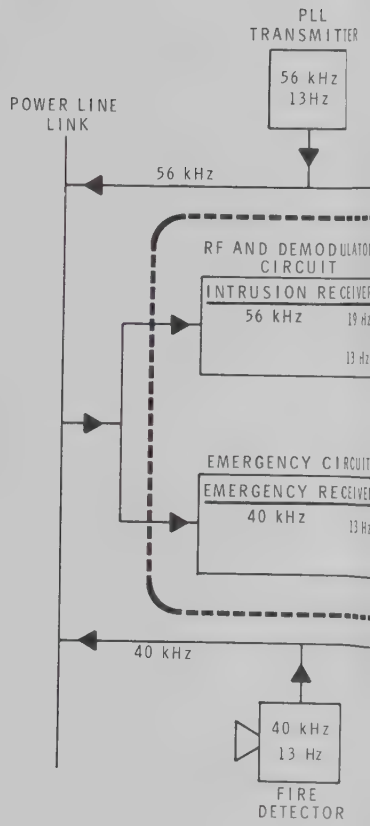
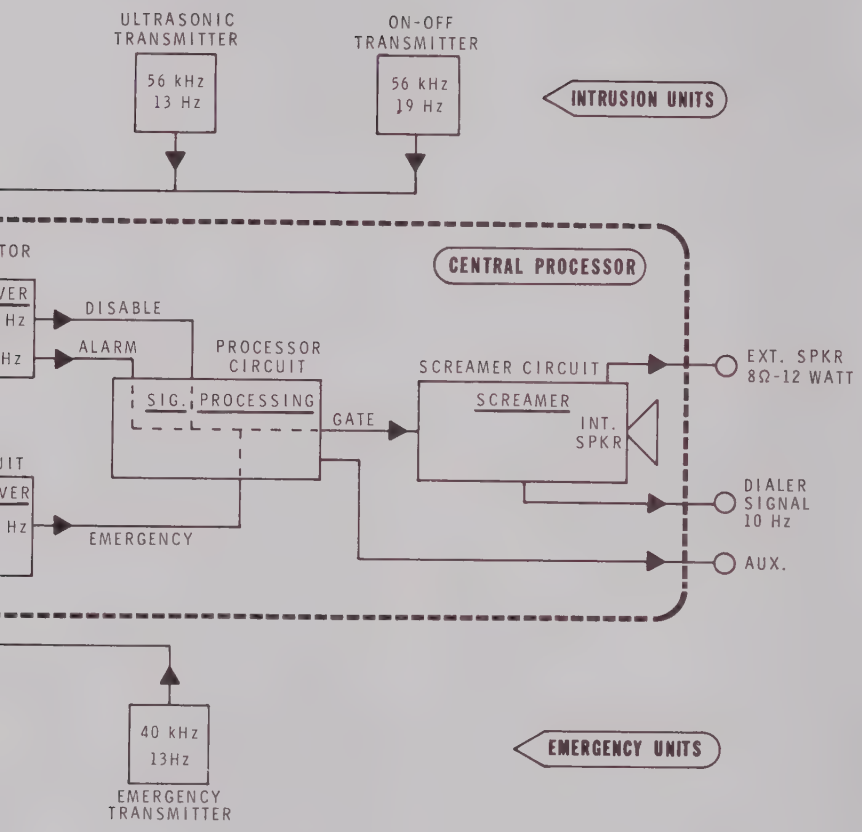

SCREAMER CIRCUIT BOARD
RF AND DEMODULATOR CIRCUIT BOARD
SPEAKER SWITCH SW301
ON
OFF
SPEAKER
TP2
R112
HI
T101
TP1
TP4
TP8
TP6
TP3
TP7
TP 0
TP11
TP5
TP9
HAZARDOUS AC VOLTAGE IN THIS AREA
CONNECTOR #3
CONNECTOR #4
REAR PANEL
PROCESSOR CIRCUIT BOARD
A
TEST CIRCUIT BOARD
LED D2
TEST SWITCH
DC
RF
INPUT CIRCUIT BOARD
R415
CONNECTOR #2
TP5
TP6
TP4
TP3
R16
TP2
TP1
TP3
BATTERY SWITCH SW501
OFF
ON
CONNECTOR #1
R443
TP9
TP11
TP7
TP3
TP5
TP1
T201
TP6
LO
R212
TP2
EMERGENCY CIRCUIT BOARD
CENTRAL PROCESSOR

Figure 3-1


PLL
TRANSMITTER
56 kHz
13Hz
POWER LINE
LINK
56 kHz
RF AND DEMODULATO
CIRCUIT
INTRUSION RECEIVE
56 kHz
19 Hz
13 Hz
EMERGENCY CIRCUIT
EMERGENCY RECEIVE
40 kHz
13 Hz
40 kHz
40 kHz
13 Hz
FIRE
DETECTOR



BLOCK DIAGRAM

THEORY OF OPERATION

Refer to the Block Diagram (fold-out from Page 82) while you read the following Description.

The Central Processor consists of four basic sections; the RF and demodulator circuit, the emergency circuit, the screamer circuit, and the processor circuit.

Whenever the PLL transmitter or ultrasonic detector is triggered, it transmits a few seconds burst of signal. This signal is carried through the power line and consists of a 56 kHz carrier that is frequency modulated at 13 Hz.

This 13 Hz FM signal is received by the RF and demodulator circuit where it is demodulated to a square wave and then coupled through selective audio circuits to the processor circuit. The processor circuit delays this "alarm" signal for approximately 20 seconds and then triggers the screamer circuit and external alarm.

If the on-off transmitter is activated, it transmits a steady 19 Hz frequency modulated signal on a 56 kHz carrier into the power line. This signal is also received by the RF and demodulator circuit where it is demodulated and then coupled to another point in the processor circuit after the delay circuit. This 19 Hz "inhibit" signal locks the processor circuit so that it will not trigger an alarm should the circuit also receive a 13 Hz "alarm" signal.

The delay in the "alarm" signal allows approximately 20 seconds for the "inhibit" signal to get ahead of it and lock the alarm circuit off.

Whenever the emergency transmitter or fire detector is triggered, it transmits a steady 40 kHz carrier that is modulated by 13 Hz. This "emergency" signal is received by the emergency circuit and is coupled to the processor circuit after the delay circuitry. This means that an alarm is sounded without delay.

Refer to the "Circuit Description" for a more complete understanding of how the Central Processor works.

CIRCUIT DESCRIPTION

Refer to the Block Diagram on Page 82 and the Schematic Diagram (fold-out from Page 91) while you read the following description.

RF AND DEMODULATOR CIRCUIT

The signal from a transmitter is transmitted through the power line to the Central Processor where it is coupled to transformer T101 on the RF and demodulator circuit board. Here the signal voltage is stepped up and coupled to a parallel resonant filter circuit formed by the secondary winding of transformer T101 and capacitor C101. This filter circuit rejects unwanted frequencies. Sections A, B, and C of IC A101 amplifiy the signal and act as limiters.

Capacitor C102, C103, and resistors R103, and R104, provide coupling and biasing for the linear operation of IC A 101. Resistor R131 and capacitor C113 provide power supply decoupling.

The output of A102-A is "high" whenever both inputs are "low." This type of operation provides an output from A102-A that is proportional to the phase difference between the transmitted signal and the output of the voltage-controlled oscillator (VCO).

Resistors R106 and R107, and capacitor C105, form a low-pass filter, passing only the low frequency components of the phase-detected signal. This filtered output is then fed to the VCO through pin 3 of A103. The voltage at pin 3 controls the channel resistance of an MOS transistor, which varies the frequency of the VCO.

The VCO is a resistor-coupled Oscillator, with A103 providing sufficient gain for oscillation. The frequency of oscillation is determined by capacitor C106, and an effective resistor that is composed of resistors R110A, R110B, R112, R133, R111, and the channel resistance of the MOS Transistor. The frequency of oscillation is adjusted to 56 kHz by R112.

If the "beat" frequency between the VCO and the transmitted signal is low enough to be passed by the low-pass filter, the VCO will "capture" and lock on the transmitted signal. The output of the low-pass filter now follows the 13 Hz square-wave modulation of the 56 kHz transmitted alarm signal.

Resistor R108 and capacitor C108 provide additional low-pass filtering of the demodulated signal. The 13 Hz square wave is coupled through capacitor C107 to IC A105, where it is amplified. Resistors R132, R134, R113, and R114 provide threshold biasing for IC A105. The amplifier is biased off by 0.1 volts. The signal from the low-pass filter must be at least .1V peak above its average value to be further processed.

At this point, the signal is fed to two frequency filters, 13 Hz and 19 Hz, to be tested for frequency. If it passes the 13 Hz filter, an alarm level is generated. If it passes the 19 Hz filter, an "off" signal is produced.

The filters are identical except for the frequency determining Resistors, R117 and R123. For simplification, only the operation of the 13 Hz alarm filter is detailed.

This filter is made up of a 13 Hz oscillator and a gate. The oscillator is an emitter-coupled type, with current sources providing the charging current for capacitor C110. The value of current sources is set by R121 and R122. The oscillator will synchronize with the signal from IC A105 by feeding this signal through R120. The oscillator will not synchronize with the demodulated signal unless the frequency is within ±15% of the oscillator frequency. The output from the oscillator is amplified by transistor Q101. The phase at the collector of Q101 will differ by 180 degrees from the output signal of IC A105, if the oscillator is synchronized.

When the oscillator is synchronized, because of the 180 degrees phase relationship, one of the two inputs of gate A102-C will always be "high." This condition produces zero volts at the output. When the oscillator is not synchronized, a 10 volt peak to peak signal will be at the output of gate A102-C. This signal is filtered by resistor R128 and capacitor C112 to drive transistor Q102. The state of Q102 indicates to the signal processing circuit if an alarm signal is being transmitted. When the output of gate A102-C is zero, transistor Q102 switches "off," giving a "high" output, indicating an alarm signal has been received.

EMERGENCY CIRCUIT

The emergency circuit operates in exactly the same manner as the RF and demodulator circuit, except that it uses a 40 kHz carrier instead of a 56 kHz carrier. However, since the emergency system does not contain a 19 Hz transmitter, there is no counterpart for IC A102B and no "disable" signal.

PROCESSOR CIRCUIT

The "alarm" signal from pin 6 of connector #4 is coupled to transistor Q408. This causes Q408 to conduct which, in turn, causes transistor Q409 to conduct. As transistor Q409 conducts, capacitor C410 charges. (This is the delay capacitor.)

Pin 2 of IC A401 has been low which made pin 6 of IC A401 high. Now, due to the charge on capacitor C410, pin 2 becomes high which causes IC A401 to switch and pin 6 becomes low. This low condition is coupled back through diode D412 to the collector of Q408 to keep transistors Q408 and Q409 turned off.

In the meantime, IC A401 will remain in its present switched state (for approximately 20 seconds) until the charge on capacitor C410 discharges through resistor R425, at which time IC A401 will switch back again. Pin 2 becomes low and pin 6 high again.

If the alarm signal is still present, transistor Q408 and Q409 will conduct again and the timing cycle repeats itself. However, if the alarm signal has now been removed, transistors Q408 and Q409 will remain off but in a prepared state to receive an alarm signal.

Every time that IC A401 switches high, a positive pulse, preceded by a 20 second delay, is produced at pin 6 of IC A401. This pulse is amplified by transistors Q410 and Q411 and charges capacitor C415. The charge on C415 is coupled through R447 to pin 2 of IC A403.

Pin 2 of IC A403 has been low, which made pin 6 of IC A403 high. Now pin 2 goes high due to the charge on capacitor C415, which causes pin 6 of IC A403 to go low. This low is coupled to transistor Q414, which causes Q414 to conduct heavily.

Transistor Q414 activates the screamer circuit board also and energizes the relay, which connects the auxiliary output terminals together through resistor R454.

When a 19 Hz "disable" signal appears on pin 5 of connector #4, it is coupled through resistors R412, R437, and R440 to transistor Q413. This turns transistor Q413 on, which charges capacitor C419. This charge on C419 causes pin 2 of IC A402 to go high and pin 6 goes low. Now, when an alarm signal arrives at resistor R447 on its way to IC A403, it is shorted through diode D416 to pin 6 of IC A402 and, as a result, the alarm is not activated.

Note that the disable signal bypasses the 20 second delay that the alarm signal goes through. In this way, you have 20 seconds to disable the alarm after the alarm circuit has been triggered.

The "emergency" signal from pin 6 of connector #1 is coupled through diode D417 directly to pin 2 of IC A403. This drives pin 2 high and pin 6 low, and turns Q414 on, regardless of any alarm or disable signals that may be present.

POWER SUPPLY

During normal operation, transistor Q403 receives its base drive directly from the secondary windings of the power transformer and keeps transistor Q402 turned off. If there should be a power failure, the base drive to Q403 is lost and Q403 shuts off. This allows transistor Q402 to conduct by means of battery voltage. This turns transistor Q401 on and supplies battery voltage to the screamer circuit, through diode D415 and resistor R442, to limit the current drain.

At the same time, battery voltage is coupled through diode D402 and resistors R437 and R440 to the base of transistor Q413, which keeps Q413 turned off.

Voltage is also applied to the base of transistor Q408 through resistor R413, which triggers the transistor the same as though an alarm signal had been transmitted. After a 22 second delay, the alarm will sound using battery power.

SCREAMER CIRCUIT

IC A302 is a multivibrator which produces an audible square wave signal of approximately 800 Hz. Transistor Q301 is turned on and off by IC A301B at approximately 10 Hz. Transistors Q302 and Q303 are turned on and off by IC A301A at approximately 1 Hz. When transistors Q301 and Q303 are turned on, IC A302 increases in frequency to approximately 2300 Hz. All of this produces an alarm signal that raises and lowers in pitch between 800 Hz and 2300 Hz.

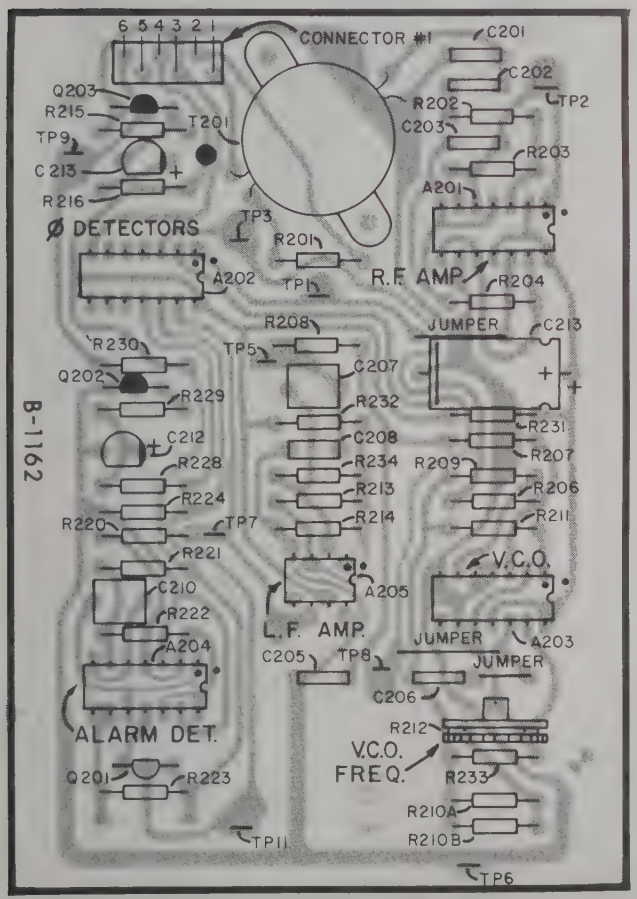
The alarm signal is squared up by diode D301 and amplified by transistors Q304, Q305, Q306, and Q307. This square wave switches between supply voltage and ground. The screamer circuit, with the exception of the audio amplifier, is gated by switching power on and off to the oscillator stages.

CIRCUIT BOARD X-RAY VIEWS

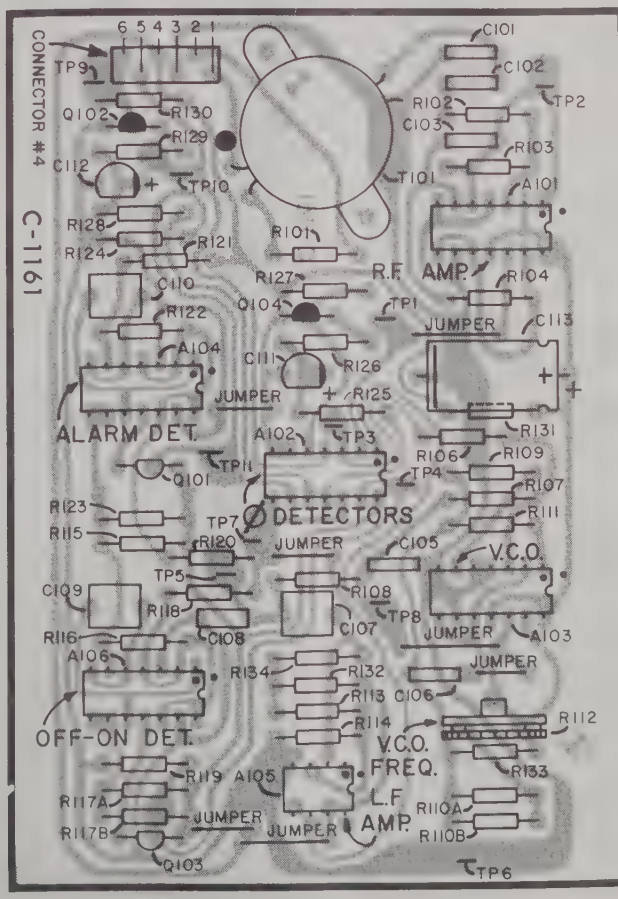
NOTE: To identify a part so you can order a replacement, proceed as follows:

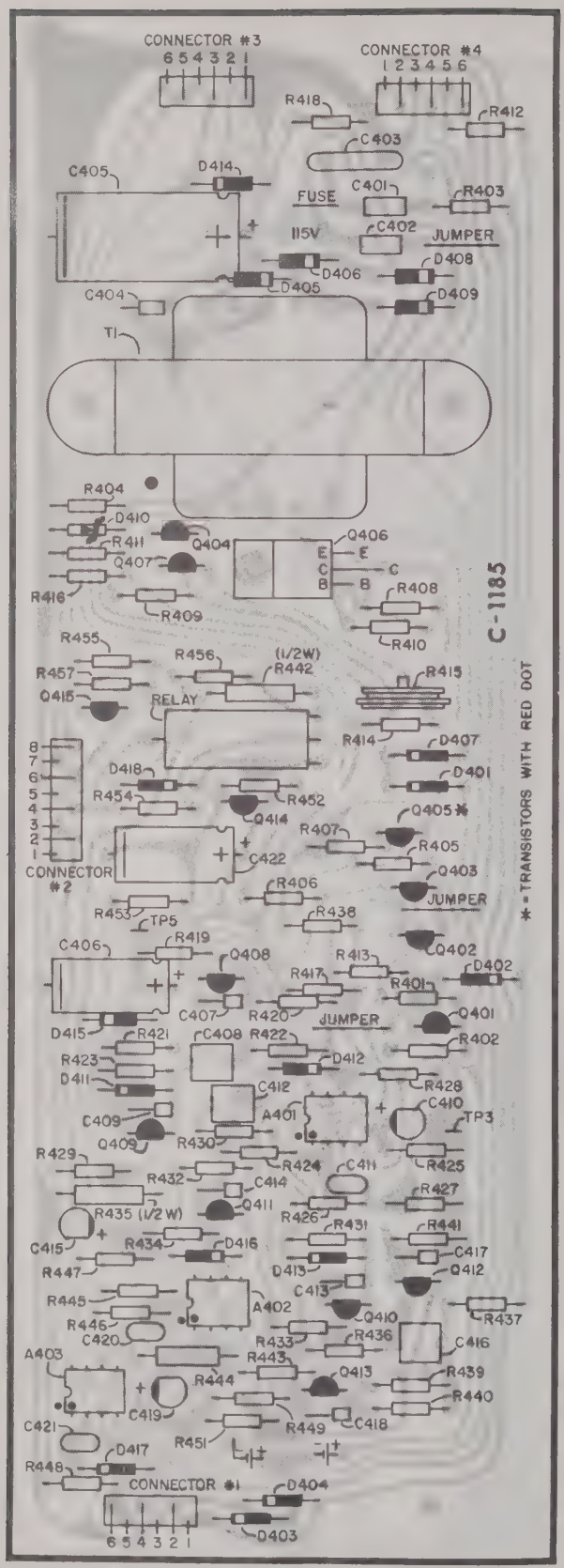
1. Note the identification number of the part (R-number, C-number, etc.).
2. Locate the same identification number (next to the part) on the Schematic. The "Description" of the part (for example: 22 kΩ, .05 μF, or 2N5232A) will also appear near the part.
3. Look up this Description in the Parts List.

EMERGENCY CIRCUIT BOARD

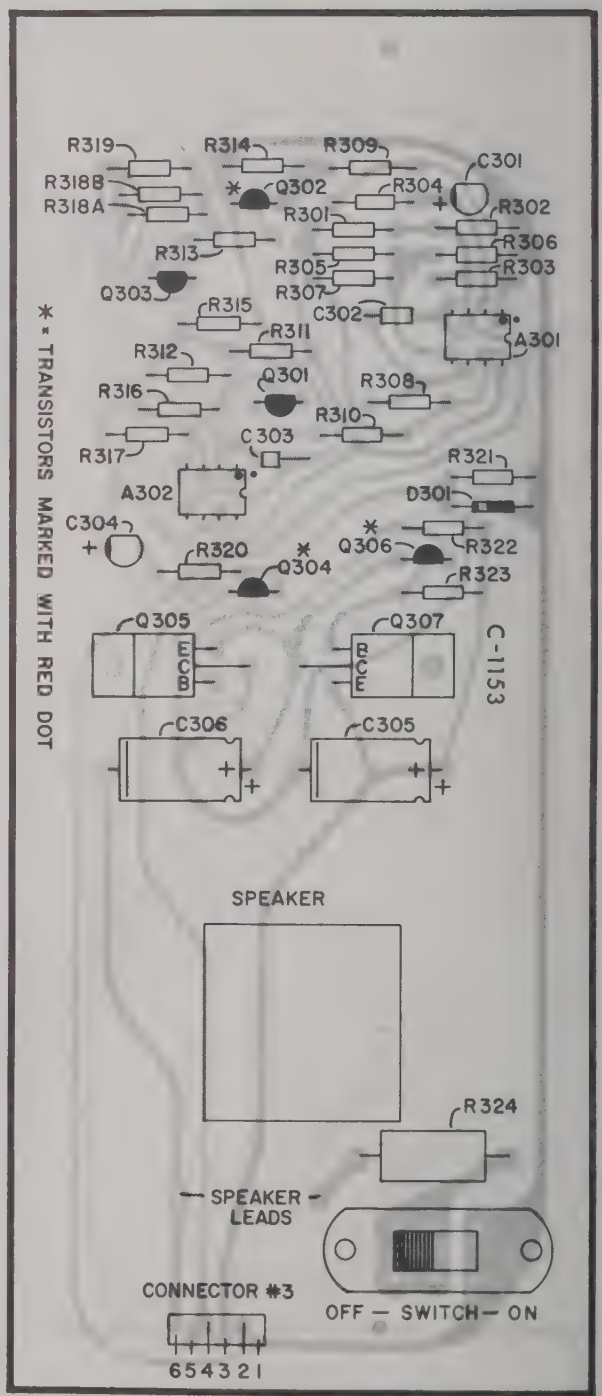


RF DEMODULATOR CIRCUIT BOARD

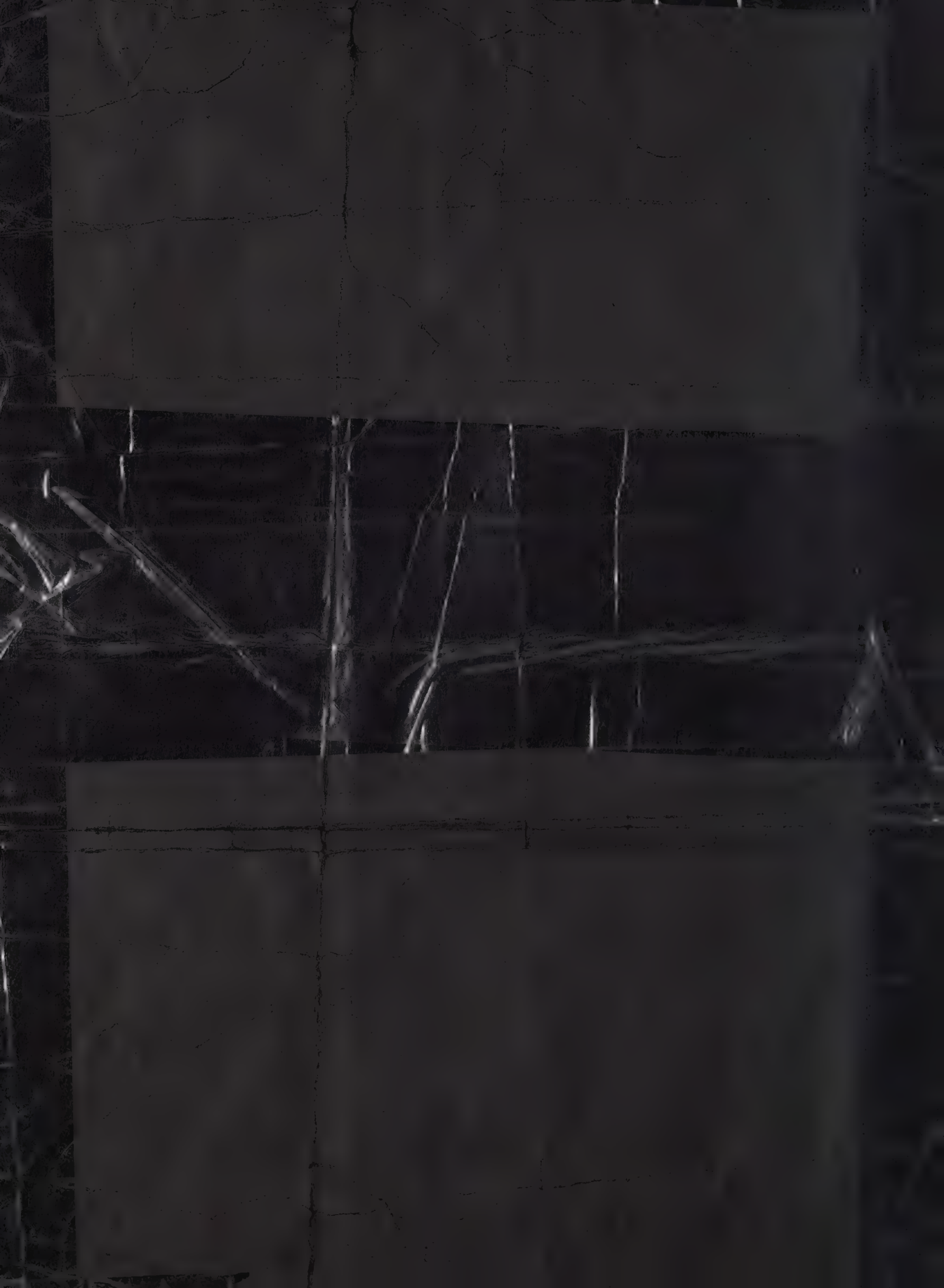




PROCESSOR CIRCUIT BOARD
(Viewed from component side)

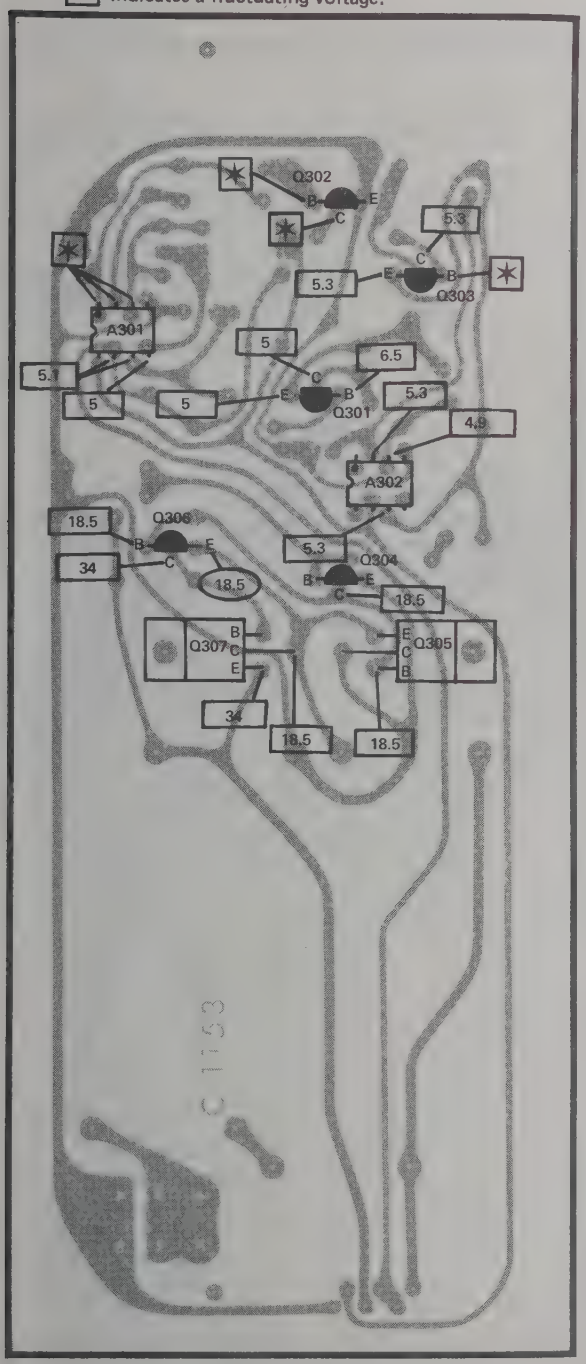


SCREAMER CIRCUIT BOARD
(Viewed from component side)

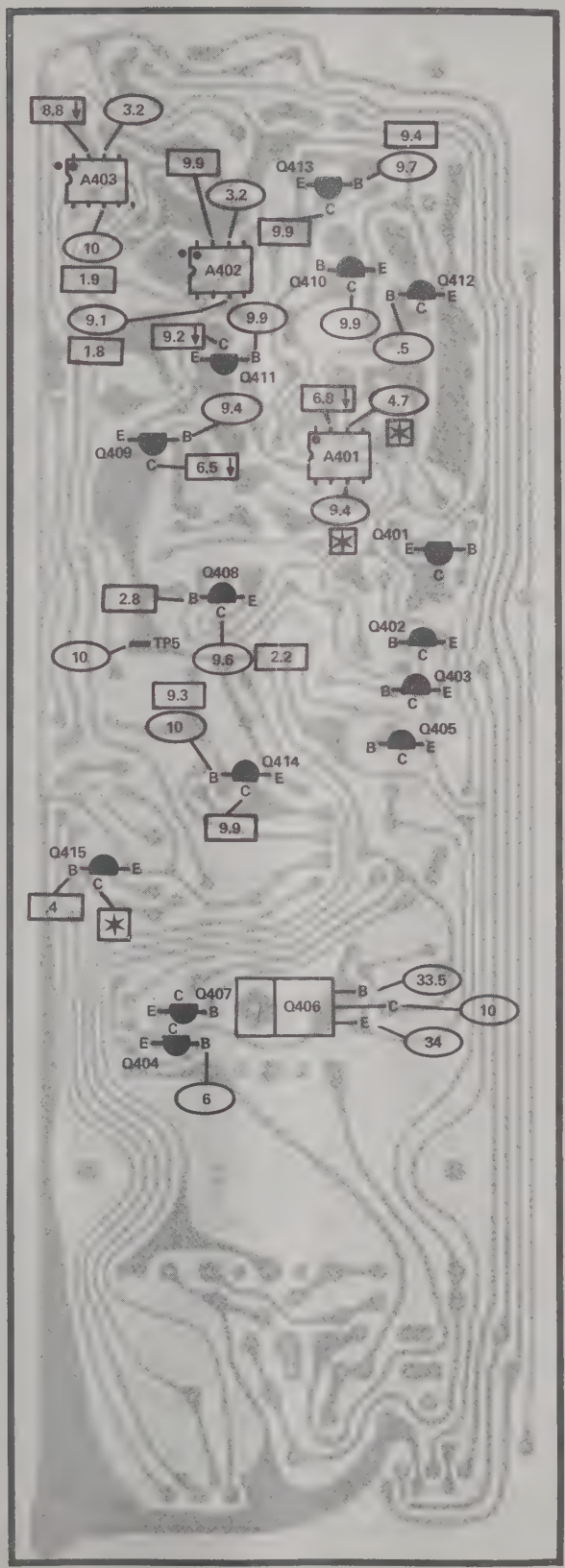


NOTE: The voltages on the screamer circuit board were measured with a jumper connected between the banded end of D418 and TP5. This simulates an activated condition.

✶ indicates a fluctuating voltage.



SCREAMER CIRCUIT BOARD
(Viewed from foil side)



OCESSOR CIRCUIT BOARD
(Viewed from foil side)

CIRCUIT BOARD VOLTAGE CHARTS

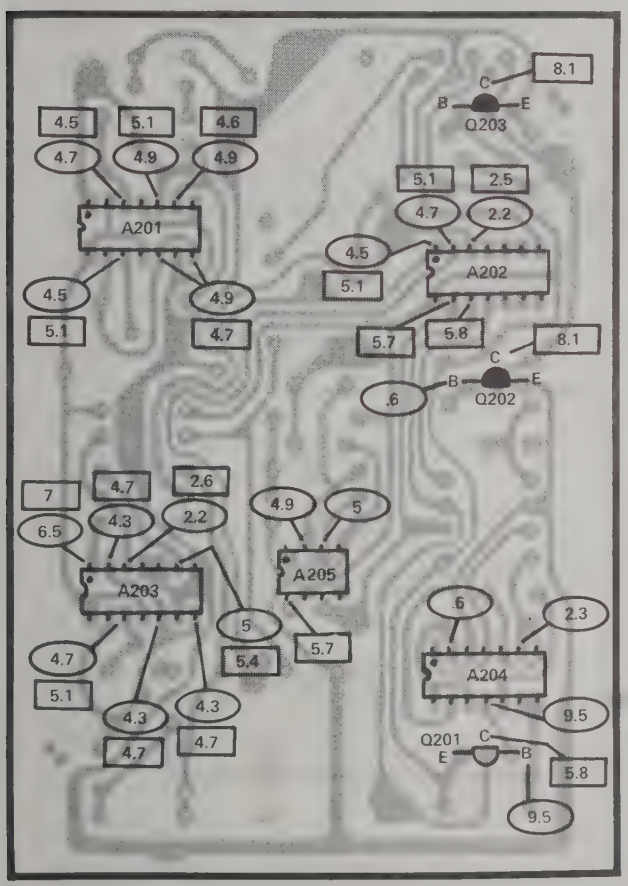
NOTES:

INDICATES A NO-SIGNAL VOLTAGE (NO TRANSMITTERS TRIGGERED).

INDICATES A VOLTAGE TAKEN UNDER SIGNAL CONDITIONS (TRANSMITTER TRIGGERED).

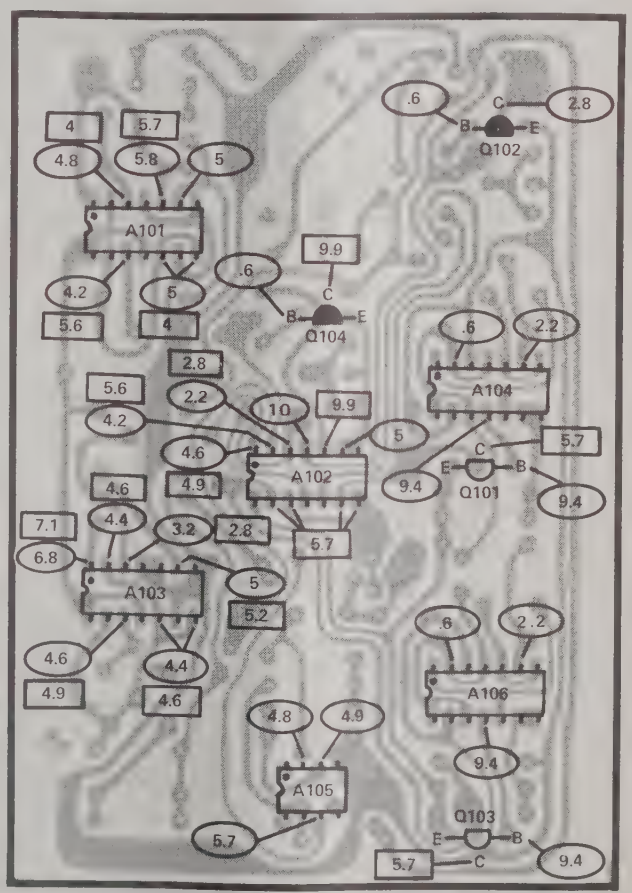
INDICATES A FLUXUATING VOLTAGE

INDICATES A VOLTAGE UNDER SIGNAL CONDITIONS THAT RISES TO THE LEVEL INDICATED AND THEN SLOWLY DECREASES.



EMERGENCY CIRCUIT BOARD

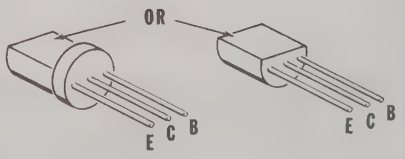
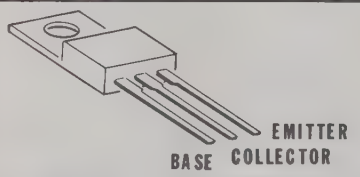
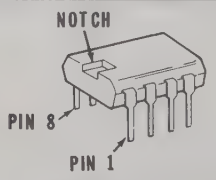
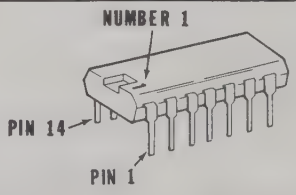
(Viewed from Foil Side)

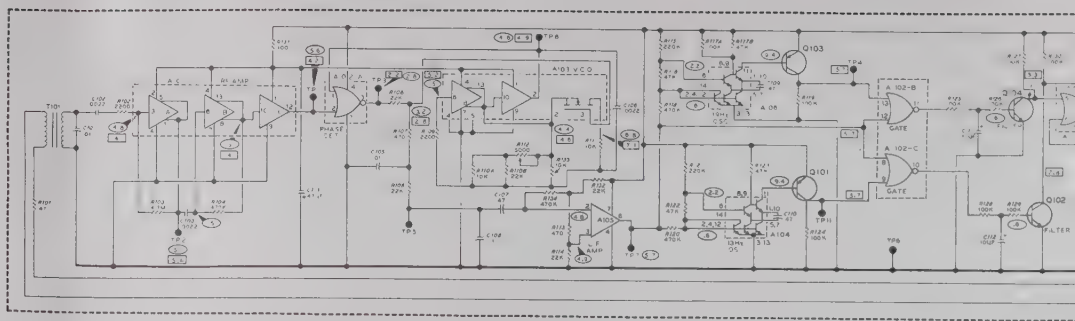


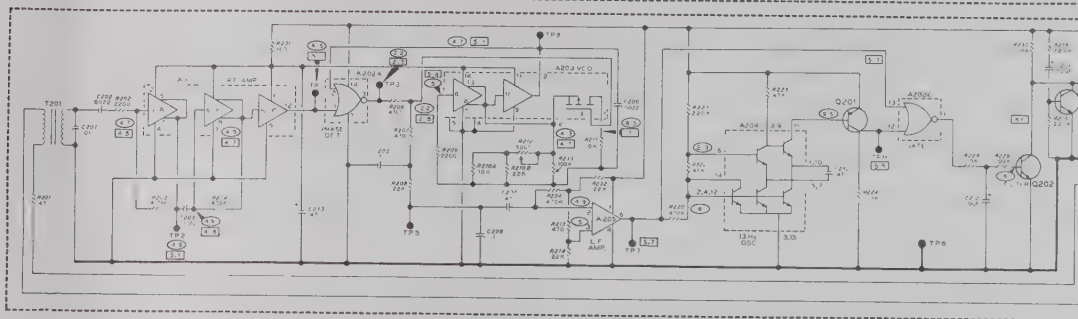
RF AND DEMODULATOR CIRCUIT BOARD

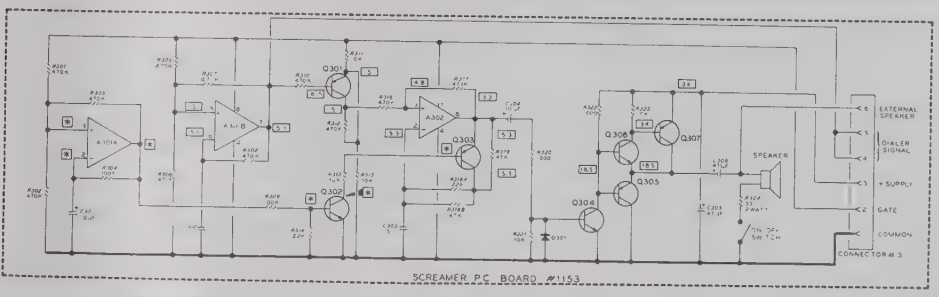
(Viewed from Foil Side)

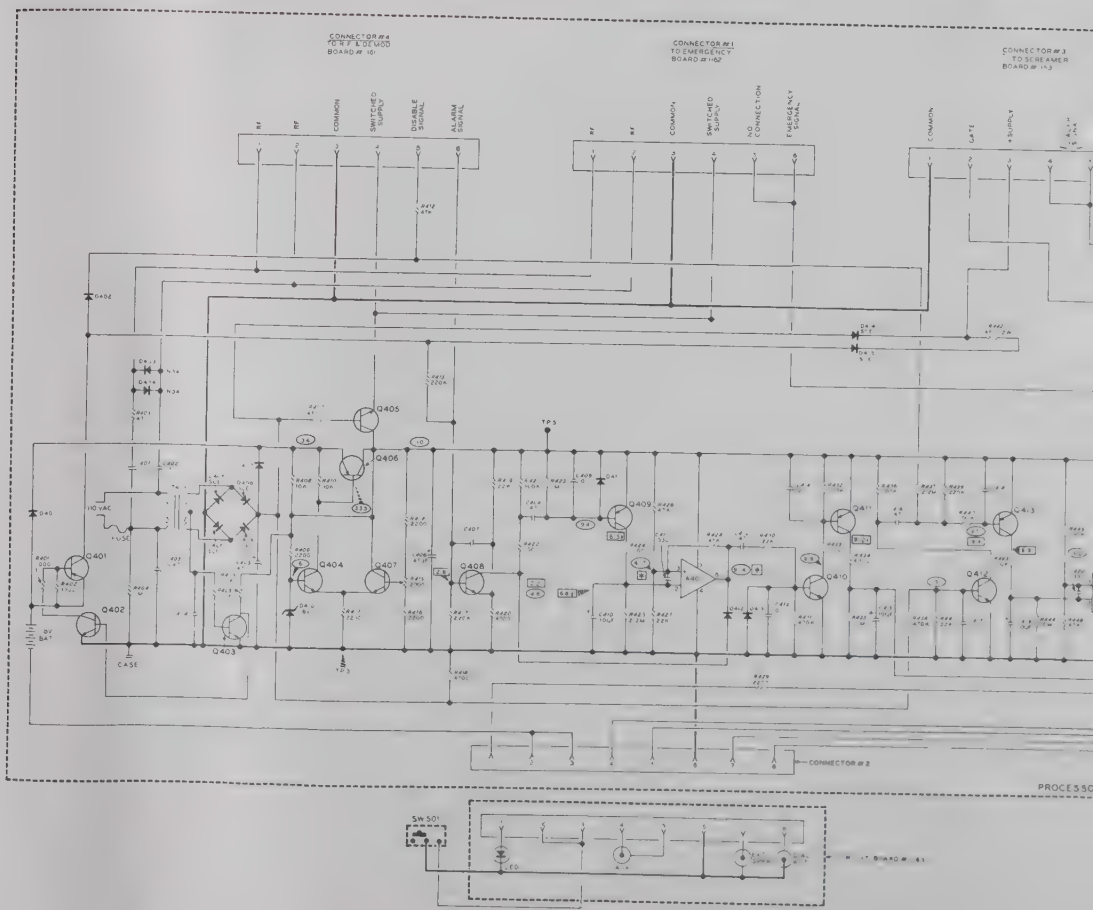
SEMICONDUCTOR IDENTIFICATION CHART

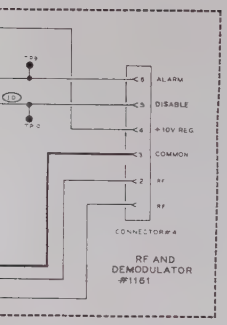
SCHEMATIC NUMBER	HEATH PART NUMBER	MANUFACTURER'S NUMBER	LEAD IDENTIFICATION
Q302, Q304, Q306, Q405	417-94	B-1101, 2N3416 GE-5508	
Q101, Q103, Q201, Q301, Q303, Q401, Q409, Q411, Q413, Q414,	417-201	GE 1691, X29A829 B-1098	
Q102, Q104, Q202, Q203, Q402, Q403, Q404, Q407, Q408, Q410, Q412, Q415	417-118	GE4936, 2N3393 B-1097	
Q305, Q307, Q406.	230-1503	64566 2N6106	
A205, A302, A401, A402, A403, A105	442-22	A-1060, N5741V 741	
A301	442-21	A-1061, A-1325, N5558V	
A202 A102	443-695	CD4001 AE	
A101, A103, A201, A203	443-604	CD4007AE CA3600E	
A104, A204, A106	230-1539	CA3086	

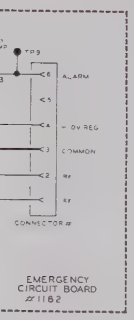


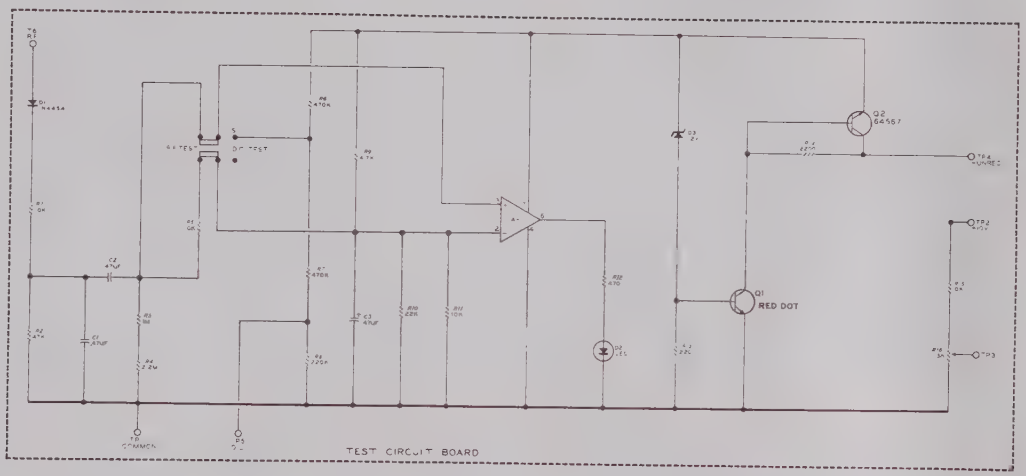


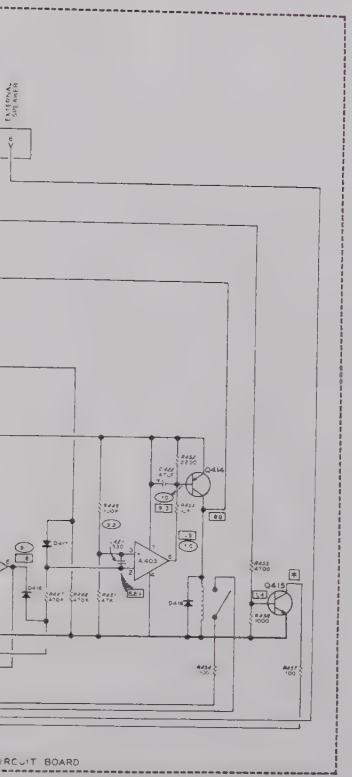

SCREAMER P.C. BOARD #1153


CONNECTOR #4 TO R.F. LOCKWOOD BOARD #101
CONNECTOR #1 TO EMERGENCY BOARD #1162
CONNECTOR #3 TO SCREAMER BOARD #1153
CONNECTOR #2
SW 501









SCHEMATIC OF THE HEATHKIT® CENTRAL PROCESSOR MODEL GDA-1158-1

NOTES

1. CIRCUIT BOARD PARTS ARE IN THE FOLLOWING GROUPS
   - 101-199 PARTS ON THE RF AND DEMODULATOR CIRCUIT BOARD.
   - 201-299 PARTS ON THE EMERGENCY CIRCUIT BOARD
   - 301-399 PARTS ON THE SCREAMER CIRCUIT BOARD
   - 401-499 PARTS ON THE PROCESSOR CIRCUIT BOARD
   - 501-599 PARTS ON THE REAR PANEL.
2. REFER TO THE X-RAY VIEWS FOR THE PHYSICAL LOCATION OF PARTS
3. ALL RESISTORS ARE 1/4-WATT UNLESS OTHERWISE STATED
4. ALL CAPACITOR VALUES LESS THAN 1 ARE IN µF AND ALL CAPACITOR VALUES MORE THAN 1 ARE IN pF UNLESS OTHERWISE STATED
5. ⬭ THIS SYMBOL INDICATES A DC VOLTAGE MEASUREMENT TAKEN WITH NO TRANSMITTER ON THE LINE
6. ▭ THIS SYMBOL INDICATES A DC VOLTAGE MEASUREMENT TAKEN UNDER SIGNAL CONDITIONS (A TRANSMITTER IS TRIGGERED)
7. ▭ THIS SYMBOL INDICATES A VOLTAGE UNDER SIGNAL CONDITIONS THAT RISES TO THE LEVEL SHOWN AND THEN DECREASES
8. ✳ THIS SYMBOL INDICATES A FLUCTUATING VOLTAGE
9. DC VOLTAGE MEASUREMENTS WERE TAKEN WITH A HIGH IMPEDANCE INPUT VOLTMETER FROM THE POINT INDICATED TO CHASSIS GROUND (TP 3)

VOLTAGES MAY VARY ± 20%

FOR PARTS REQUESTS ONLY

- Be sure to follow instructions carefully.
- Use a separate letter for all correspondence.
- Please allow 10 - 14 days for mail delivery time.

DO NOT WRITE IN THIS SPACE

INSTRUCTIONS

- Please print all information requested.
- Be sure you list the correct **HEATH** part number exactly as it appears in the parts list.
- If you wish to prepay your order, mail this card and your payment in an envelope. Be sure to include 10% (25¢ minimum, $3.50 maximum) for insurance, shipping and handling. Michigan residents add 4% tax.

  Total enclosed $_____
- If you prefer COD shipment, check the COD box and mail this form. COD ☐

NAME _____

ADDRESS _____

CITY _____

STATE _____ ZIP _____

The information requested in the next two lines is not required when purchasing nonwarranty replacement parts, but it can help us provide you with better products in the future.

Model # _____ Invoice # _____

Date Purchased _____ Location Purchased _____

LIST **HEATH** PART NUMBER	QTY.	PRICE EACH	TOTAL PRICE
TOTAL FOR PARTS			
HANDLING AND SHIPPING			
MICHIGAN RESIDENTS ADD 4% TAX			
TOTAL AMOUNT OF ORDER			

SEND TO: **HEATH COMPANY**
BENTON HARBOR
MICHIGAN 49022
ATTN: PARTS REPLACEMENT

Phone (Replacement parts only): 616 982-3571

THIS FORM IS FOR U.S. CUSTOMERS ONLY
OVERSEAS CUSTOMERS SEE YOUR DISTRIBUTOR

CUT ALONG DOTTED LINE

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CUSTOMER SERVICE

REPLACEMENT PARTS

Please provide complete information when you request replacements from either the factory or Heath Electronic Centers. Be certain to include the **HEATH** part number exactly as it appears in the parts list.

ORDERING FROM THE FACTORY

Print all of the information requested on the parts order form furnished with this product and mail it to Heath. For telephone orders (parts only) dial 616 982-3571. If you are unable to locate an order form, write us a letter or card including:

- Heath part number.
- Model number.
- Date of purchase.
- Location purchased or invoice number.
- Nature of the defect.
- Your payment or authorization for COD shipment of parts not covered by warranty.

Mail letters to: Heath Company
Benton Harbor
MI 49022
Attn: Parts Replacement

Retain original parts until you receive replacements. Parts that should be returned to the factory will be listed on your packing slip.

OBTAINING REPLACEMENTS FROM HEATH ELECTRONIC CENTERS

For your convenience, "over the counter" replacement parts are available from the Heath Electronic Centers listed in your catalog. Be sure to bring in the original part and purchase invoice when you request a warranty replacement from a Heath Electronic Center.

TECHNICAL CONSULTATION

Need help with your kit? — Self-Service? — Construction? — Operation? — Call or write for assistance. you'll find our Technical Consultants eager to help with just about any technical problem except "customizing" for unique applications.

The effectiveness of our consultation service depends on the information you furnish. Be sure to tell us:

- The Model number and Series number from the blue and white label.
- The date of purchase.
- An exact description of the difficulty.
- Everything you have done in attempting to correct the problem.

Also include switch positions, connections to other units, operating procedures, voltage readings, and any other information you think might be helpful.

Please do not send parts for testing, unless this is specifically requested by our Consultants.

Hints: Telephone traffic is lightest at midweek — please be sure your Manual and notes are on hand when you call.

Heathkit Electronic Center facilities are also available for telephone or "walk-in" personal assistance.

REPAIR SERVICE

Service facilities are available, if they are needed, to repair your completed kit. (Kits that have been modified, soldered with paste flux or acid core solder, cannot be accepted for repair.)

If it is convenient, personally deliver your kit to a Heathkit Electronic Center. For warranty parts replacement, supply a copy of the invoice or sales slip.

If you prefer to ship your kit to the factory, attach a letter containing the following information directly to the unit:

- Your name and address.
- Date of purchase and invoice number.
- Copies of all correspondence relevant to the service of the kit.
- A brief description of the difficulty.
- Authorization to return your kit COD for the service and shipping charges. (This will reduce the possibility of delay.)

Check the equipment to see that all screws and parts are secured. (Do not include any wooden cabinets or color television picture tubes, as these are easily damaged in shipment. Do not include the kit Manual.) Place the equipment in a strong carton with at least THREE INCHES of *resilient* packing material (shredded paper, excelsior, etc.) on all sides. Use additional packing material where there are protrusions (control sticks, large knobs, etc.). If the unit weighs over 15 lbs., place this carton in another one with 3/4" of packing material between the two.

Seal the carton with reinforced gummed tape, tie it with a strong cord, and mark it "Fragile" on at least two sides. Remember, the carrier will not accept liability for shipping damage if the unit is insufficiently packed. Ship by prepaid express, United Parcel Service, or insured Parcel Post to:

Heath Company
Service Department
Benton Harbor, Michigan 49022

HEATH

Schlumberger

MP MASTER

MA22817

HEATH COMPANY • BENTON HARBOR, MICHIGAN

THE WORLD'S FINEST ELECTRONIC EQUIPMENT IN KIT FORM

LITHO IN U.S.A.